

YOUR

Mag

NOVEMBER 1989 \$1.50

COMMODE

AMIGA • C64 • PLUS 4 • PC • C128

Comic Watch
Neon Zone
Rik of the Journos



MOONWALKER

'YOUR PROGRAMMER' Pull-Out



ISSN 0269-8079



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YOUR COMMODORE

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YOUR PROGRAMMER

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Deputy Editor: Richard 'Power' Henderson
Technical Editor: Paul 'Where' Eves
Group Editor: Stuart 'Pet Shop Boys' Cooke
Advertisement Manager: Paul 'Poppet' Kavanagh
Sales Executive: Maria 'Bananarama' Wade, Tony 'Big Fun' Flanagan
Ad-Copy Control: Karen 'Peyton' Backford
Artist: Alan 'Iron Maiden' Barber
Designer: Mark 'Arc' Newton
Origination: Ebony
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Game Show Goodies

The jangle of Christmas bells will come early this year as the tills at the Personal Computer Show ring in the new year. Panic will no doubt be quickening the hearts of the programmers and managers throughout the country as the 25th of September deadline approaches.

Although there are always a few surprises which are kept under wraps until the last minute, a few morsels are thrown to the press to whet the appetite. So far Pygmalion is flexing its muscles to carry off the award as the most prolific software house of the decade. The company has lined up no less than 43 new releases for launch over the next seven months.

Fully animated aliens have been introduced by the Pandora team and housed into a 16 bit beast called *Project Xynopsis*. Also from the Introspector Group, the low price label, Premier Ridge, deliver its latest Joe Blade epic.

There's always an international flavour to the Show and high quality software is the latest Spanish resort. Microdigital Soft is launching Dinamic's PC version of *Navy Moves* plus three new titles: *Grand Prix Master*, a



SPEAKETH...

On Sunday 17th August 1989 I was invited to participate in the computer industry event of the year. Grandslam Entertainment had hired Lison Town's football ground for the day, and run a charity soccer tournament in aid of the Hillsborough disaster fund and the baby care unit at Liverpool Maternity Hospital.

Needless to say that although the journalists came rain-soaked on the day, due to a rather exciting penalty shoot-out, both Paul Kavanagh and myself thoroughly enjoyed our day out and we look forward to competing next year. Apparently over £3,000 was raised on the day and congratulations must go to Stephen Wall of Grandslam and everybody else involved in the organisation for making it a successful venture.

This brings me nicely to the subject of football related games. Although we shall be exploring these in much greater detail in a later issue, I just find it quite startling that this year so many licensed soccer games are being released.

There's the Liverpool, Arsenal and Saint and Grimsby games from Grandslam; Gazza's Super Soccer from Empire; Manchester United from Emulac; and Super League Boss from Analogic (being programmed with advice from Lou Macari). As soon as Vinny Jones' boxing comes out my life will be complete.

Look after yourselves until next issue and don't let your skin-pads slip...

Rik Henderson

Star Performers

Star has extended its range of LC series printers with the addition of three A3 landscape format machines, one sporting a bottom feeder (can we say that to our readers?).

The LC-15 is a wide carriage (16.5 inches) version of the fast, new LC-10 II. Both machines are developments of the phenomenally successful LC-10 but now with go-faster stripes added to their performance (85ips in NLQ). The LC-15 is the one which is also available as a bottom feed

new Freddy Hardest adventure called *South of Nowhere*, and *After the War* a post nuclear holocaust entertainment.

Andrew Huxton will be hoping for a bonus Show this year after being directed by his star programmers on the eve of last year's exhibition. Amongst the games on preview this year is *Scavenger*, John Philips follow up to *Elephant* and *Kobolds*.

CDS has stooped to appealing to the lowest common denominator with a range of games from US-based Artwork. Ironically dubbed as 'adult software', the first two games are *Strip Poker* and *Conningfield Squares*. Wrist-aching action for those who get their jollies from digitised dillies.

Mindscape's new games comprise *Star Trek V*, *Harley Davidson*, *Finalist Freddy* and *Life or Death*. The latter is a blood and guts operation which places the surgeon's electronic knife into the player's hands - should hit the right vein for high lives but it may cost you an arm and a leg.

Touchline: *The Personal Computer Show*, Earl's Court, London. 27 September (for October/Trade only: 28-29 September).

version. Similarly the LC24-15 is a wider, faster version of the LC24-10.

Although Star Microcin classed its LC series printers as 'low-cost' business machines, the range is eminently suitable for home use. The prices start at £199 for the LC-10, £299 for the LC-10 II and LC24-10, £299 for the LC-10 volume version and rise to \$999 and \$499 for the LC-15 and LC24-15 respectively.

Touchline: Star Microcin UK, Queen Moors, 40 Dorkshire Road, Ealing, London W3 3BS. Tel: 01-840 1800.

Art of Tea-leaving

It's difficult to understand what someone is saying when their tongue is placed firmly in their cheek, however, we understand that Electronic Art's *Knof the Thief* promises to steal the Show this September.

Designed for Amiga and PC users who find *The Lord's Tale* too serious and esoteric, *Knof* has his feet planted firmly on the ground as he creeps around Trivcity looking for a few take-aways. Thieving comes easily to *Knof* as he searches for the six pieces of the magic stone which will make him the new God King of Trivcity.

First, *Knof* must find the



Knof the Thief, meets *Knof the Great*, *Knof the Poet*, and *Knof the Fool*, which have a spell book. So, when there's magic about you know that *Knof*'s got the scrolls - or maybe he always walks like that.

Knof the Tale fans can take Art with the latest EA fantasy roleplaying adventure, *Swords of Twilight* (Amiga only). Written by Freddi Associates, authors of the excellent *Aranea*, the idea is to hunt the living twilight out of the guardians of the



seven enchanted swords and thereby slayed the evil *Shas* demons who have subjugated the neighbouring kingdoms. As in life, the characters have memories so be nice to the people on the way up - you're bound to meet them again on the way down.

Touchline: Electronic Arts, Langley Business Centre, 11-49 Station Road, Langley, Slough, Berkshire SL4 8TB. Tel: 04753 49442.

Winter Draws On

Nice Bithorn hope to take the *Wizard* with a patch predictor program at the unbelievably low price of £2.99!

System 8 - The Patch Predictor is a dedicated database which the user gradually builds up as each result is announced. The program then takes the data and predicts the likely outcome of future matches in all four English and three Scottish leagues.

Wang on a minute, if hundreds of people buy the software and all enter the same data week after week, surely the prediction will be



the same for everyone and won't that reduce the share of any winners? Personally, we'll stick to our lucky pin.

System 8 is available for C64, C16, Plus 4, Amstrad CPC, Atari BBC Electron and MSX (what?).

Video Rentals

You've read the magazine reviews, seen the advertising, now you can hire the video. In a rather interesting move Action Screenplay is supplying rental versions of its publicity value of the latest games releases to computer stores and video libraries.

Now, hardened game addicts will be able to thrill to the latest game demos with the added benefit of a video magazine feature in

the comfort of their living (TV) rooms. The magazine features chart talk and users of interest to maintain game fan all for a mere £1.50 rental charge.



Touchline: *Hot Shot Entertainment*, 67 Berwick Road, Colchester, Essex CO4 3AB. Tel: (0206) 714175.



Yo Gazza what's the score

Paul Gascoigne, the crown prince of soccer, has signed up to a new team. But if you are the Spurs fan don't worry, he is not leaving Tottenham, instead Gazza has signed up for Empire Software and will star in Gazza's Super Soccer.

The game is due for release in October on Amiga and C64 and, if you believe the hype, carries more features than there are calories in a Mars bar. Top of the list is the "Boot-o-mat". This gives the player total control of the kick he is about to play, height, strength or spin.

The pitch view will be different. With a number of variants depending on the position of the ball, though Empire say "it will work



well".

What if the Spurs fan does not own a computer? Fortunately the game can be set for most of the 92 league sides and Scottish Premier Teams. Although I am sure it would be easier to play

with Gazza, than against (unless your name is Gary Lineker).

If the game has any of the personality of the Mars Bar Kid it should do well and may even top the league, unlike Gazza's other team.

Go-ing for Gold

It's all systems Go for a trip to Taiwan for Switzerland's Anders Kierulff, the winner of the first Acorn Computer Olympiad which was held on 12 August at London's Park Lane Hotel. All Kierulff had to do to win was to program the most challenging version of the popular oriental game of Go.

Each year Acorn sponsors the world's computer Go championships in Taipei, Taiwan and the Olympiad was devised partly as a qualifier for the event. Conceived and organized by David Levy, an International Chess Master, the Olympiad also invites entries for other events such as Chess, Scrabble and Back draughts and this debut attracted 85 programs from 17 countries.

In the Olympiad, programs compete against each other in a death or glory battle to the death and the medals are awarded to the winners in each category. In the 19x19 Go event the competition was expected to be stiff because the prize means a trip to compete in the world final, the winner of which can then try his program against the skills of a human expert. If the game wins, the programmer stands to claim a £1 million prize so Kierulff stands to gain a lot with his Swiss Explorer program.

Any computer or budding whizz-kids who think they can beat the world's experts can get further details from David Levy at the address below. The 1990 Acorn Computer Olympiad will be held at the same London venue from between 8 August and 14 August 1990.

Footnote: David Levy, 10 London Road, London SW18 6LP. Tel: 01-874 1316.

Star Wars Trio

Demarc is to release its three games based on the Star Wars films. The Star Wars Trilogy packs in the on-line classics Star Wars, The Empire Strikes Back and Return of the Jedi for the Amiga (£24.99), Commodore 64 cassette (£12.99) and C64 disk (£19.99).

New from Demarc: the

home computer version of Trigen's on-line race game *Ward Drive!* from US company Broderbund covers *Shogakukan Cyle* and air hockey extravaganzas against some hot alien competition and *Fantasticon*, an animation graphic designer which breaks Demarc into the stiltz program field.

Hard Drive! will be

available on November 22 for the Amiga at £19.99, PC at £24.99 and for the C64 at £9.99 (cass) and £12.99 (disk). *Fantasticon* is already in the shops but only for the Amiga and PC (£19.99).

Footnote: Demarc, Ferry House, 51-57 Lucy Road, London SW15 1PN. Tel: 01-780 2322.

Dungeon's Drag On

A year after the launch of the C64 and PC versions of the Advanced Dungeons and Dragons epic *Pool of Radiance*, US Gold's SSI division has promised that the game will appear for the Amiga before Christmas - do they mean Christmas 1989, they surely do? So what's the release date? Duno?

However, when the release date actually arrives, US Gold promises that the third scheduled AD&D game, *Battlery*, will be released one week later.

Ah! But what about the second game? Oh this the

company is almost more specific. *Dragons of Flame* will be appearing in late October for the PC and Amiga (£24.99) and in late November for the C64

(£14.99 disk, £9.99 cassette).

We look forward to this with anticipation but we're not holding our breath. Until then *Return of the Lovers* will suffice.



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Commodore
WE'LL HELP YOU SEE THINGS DIFFERENTLY

assure that almost everywhere is hostile and if you meet one of your "mission" things can get tricky.

Curse of the Azure Bonds also has a very different style of gameplay, as due to your attack on the King you don't have a fixed base to work on, so there's no systematic clearing of areas. Instead, you must follow the trail of clues and rumors to confront each of your enemies and their minions in turn.

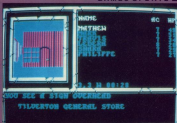
It may take time to adjust to combat with 5th, 6th, 7th and 8th level characters as you have so many other options to think about—such as which spells to use and how and when to attack. You'll also find it useful if you had an AD&D master local tavern.

There are few differences between the two versions of the game except that PC hard disk owners can do away with all the disk swapping associated with a game with 8 disk sides.

Curse of the Azure Bonds is the fourth game based on Advanced Dungeons and Dragons that began with Pool of Radiance. The good news is that there are more to come. Tony Hetherington

The AD&D games are the result of a close correlation deal between D&D authors TSR, US software houseSSI and US Gold. There are still four years of the first agreement left to run.

Below: Some of the amazing logo sprites.



Above: Save you right? You should never have visited Howard Fox's Teton Emporium and asked for "Mistral ore great".



Above: If you ever want a high ranking army officer, Tilberton's the place to be!

INFO

Gameplay: 94%
Graphics: 71%
Sound: 30%
Lastability: 95%
Overall:
78%

INFO

Gameplay: 95%
Graphics: 65%
Sound: 30%
Lastability: 95%
Overall:
71%

GEMINI WING

Virgin - £9.99 Tape, £14.99 Disk

The ultimate in gutter press has started an intergalactic war with its jingoistic outpourings. Now you have to save the day.

This game features perhaps the worst scenario in the history of computer games. It is both unlikely and unrealistic and shows no regard for the laws of physics, logic or common sense. Unfortunately, it's the best part of an otherwise forgettable game.

The scenario centres around an Earth newspaper known as the *Sunday Spirit* (I wonder what that could be?) and its silly stories about aliens turning girlfriends into potatoes and so on. According to Virgin these headlines had upset the aliens in question and when the *Sunday Spirit* went too far with the heading "Die Mutant Alien Scum" the entire forces of every planet in the galaxy arrived to destroy the Earth. But wait! Is it a bird, is it a plane? No, it's you. Armed with only a single laser Gemini fighter you take off to destroy everything else in the galaxy to save the day and rack up a high score. Oh yeah? You have a small chance of beating Top or leading England to victory in a Test series.

This takes you to the game itself which would be reasonable as a £1.99 budget

release but not as a full priced game. It's yet another about the aliens to collect extra weapons style of game. This apparently was caused by a "strange paradox in the fabric of reality" which probably also explains how Virgin can follow up a classic like *Billworms* with a game like this.

Tony Hetherington

INFO

Gameplay: 12%

Graphics: 25%

Sound: 38%

Usability: 10%

Overall:

21%

(Below: When you've killed the blob-like aliens...)



Right... it's time to kill many more blob-like aliens!



CITADEL

Activision - £9.99 Tape, £14.95 Disc

All was quiet, all was still. Darkness prevailed and neither good nor evil was present; until the monitor probes moved in to investigate an unknown power source.

For a time, nothing happened in the dark. Dark recesses of an underground complex on a distant planet. There was no light and no sound, and nothing moved.

Not had anything thought of moving for quite some time, but they were still charged up and, high above the planets surface, a probe was watching, listening, monitoring and unidentified power source.

But the planet lay dormant. Nothing moved upon it's surface, no birds flew and no fish swam in the seas, and yet, an electrical fever was being detected.

Relaying the data back to base, the probe was replaced by a transporter ship which landed live deoids upon the surface. They set about finding the power and eventually traced it to a subterranean city.

Going underground, the probe begins transmitting pictures of it's surroundings and switches manual control for you to maneuver it around the mazes of corridors which have revealed themselves.

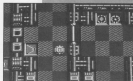
Caution is the only approach in an unknown surrounding and if you do not observe this, you will loose probes like an snakes on a hot day. As you near certain areas of floor, they open and gun turrets appear and open fire. Others open

and eject mobile death machines which roam around the maze and latch onto your trail. Following you they will launch projectiles at your probe and can seriously damage it's circuits.

However, the design of these mobile robots has one major flaw in it; they are easily re-programmed using a standard code. Utilising this flaw, your probe can issue instructions to the robots which causes a change of heart and they rebel against their creator and protect you. Once re-programming is complete, they will still follow but they will get in your way and act as a shield. However, squables still break out if you decide to have more than one born-again robot following in your footsteps. Newsmen will run into the back of those already established and cause them to explode.

There are various levels to navigate and each one contains a different breed of robot. Some seem to be armour plated and require more hits to destroy, others seem to be able to shrug off the new programming and turn against you once more. And the dangerous bit is that you can't tell when they have lost their friendship.

Your energy level depletes as you come into contact with the enemy of



Above: I wandered lonely as a small metallic deoid.



Above: And now on Deiduity Squares is Mr. Small Monitor. Deoid...

their fire, but there are bastions which contain energy and feel inviolated around the maze. Also on your travels you will find weapon pods which modify your defences. Lift shafts take you from level to level and transporters zap you from city to city.

Ultra-smooth scrolling, great sound effects and decent graphics make Citadel one of the most playable games in quite some time. It's damned addictive and the best part is that it's not just a shoot-em-up and requires a few ounces of sense and some strategic thinking to get you through. To Activision all I have to say is "please produce some more decent games like this".

Andrew Bannor

Citadel is from Electronic Dreams who produced such marvels as Super Sprint and The Incredible Shrinking Sphere. Marketed by Activision who have a recent track record of poor quality games, Citadel seems as a pleasant change.

INFO

Gameplay: 82%

Graphics: 76%

Sound: 85%

Lastability: 84%

Overall:

84%

SWORD OF ARAGON

\$51 (US Gold) - £29.99

Roleplaying, politics and war are all part of this fantasy epic.



The Duke of Aladda has died leaving you, his son, to your destiny. A destiny that demands for you to lead your people against the orc and goblin hordes and into battle with your enemies to the East. Only when you are liberator and leader of all Aragon will you fulfill your father's will.

Your first decision may be your most difficult as you must choose a character class to be throughout the game. You can be a great Warrior, Knight, Ranger, Priest or Mage - the last three making up their lack of fighting strength with magic.

Your choice of class also effects the type of armies you will raise as, for example, a Warrior can build infantry for half the cost of others.

Money plays an important part of the game as you must manage your city's affairs by setting tax rates and choosing between raising an army or developing trade and industry. Both have their priorities since you need an army to defend your city and expand, but you need resources to

develop, train and pay for it. You also have to remember that the townsfolk may not like paying taxes at 80% and may strike, leave or rebel, snuffing your chances of success.

As Duke you must prove yourself as a leader and a statesman by dealing with envoys from other towns and resolving local disputes that can have an effect on your people's health, morale and loyalty. These in turn effect your revenue and the upkeep or expansion of your army.

Each turn represents a month of time in which you must manage your resources, defend your territory and expand to liberate the land. Which will inevitably lead to battles. When a battle erupts you must organise your forces for the fray. Obviously, your tactics will vary depending on the opposition you face and the units you have at your disposal. Personally, I favour hordes that can weaken an opponent before it reaches you. Where they can be crushed by cavalry charges or by infantry armed with

swords, javelins or spears.

Priests, Mages and Rangers should be kept safe behind the line where they can use their magic to greater effect. (Although you represent one class you can hire members of the others to supplement your armies). Unlike other SSI games where magic users cast lightning bolts and heal fireballs the magic in this game is more subtle. These spells affect the movement and fighting ability of friend and foe by changing the terrain or slowing an advance. Stamina can be restored or drained and armies can be healed, confused, terrified or teleported.

As the battle continues in turns (up to a maximum of 25) victory points are awarded for losses inflicted and territory gained, which finally decide the outcome of the battle. A loss will cause a drop in morale and loyalty but a great win will bring plundered gold, new recruits for your army and experience for your troops. After a few battles these points will assist in town increases in levels which will bring more

spells to your magic users and better fighting skills to your units. For example, level 4 mounted bowmen cause more damage with every attack than level 1, 2 or 3.

The result is a fascinating game in which you gradually explore the resources and tactics that you have and learn how to use them to expand your empire. The incredibly high Loyalty factor is well named as it's the style of game that you actually enjoy the most your play. Starting with a lost point when you're not quite sure what you're doing you gain military and character experience which sends you back for more and more. I'm afraid I'm not going to get much sleep until Aragon is free and I've earned the 900 points needed to complete the game.

Tony Hetherington

SSI is the company that took the headlines with the Dragon and Dragons games. Games like this show why it got the crown.



Above: How where's that Terry's Orange?

RICK DANGEROUS

Explore the temples and avoid the traps, but will there be a chocolate orange for you at the end?

Firebird - £9.99 Tape, £14.99 Disk



Above: But Rick, that's dangerous

INFO

Gameplay: 65%
Graphics: 60%
Sound: 50%
Lastability: 45%

Overall:

55%

They say that there is no such thing as a free lunch: everything is a derivative of something else. To some extent, the same applies to computer games. Firebird's latest game, Rick Dangerous shows distinct signs of a common ancestry with assorted platform games of many years ago.

Our anonymous hero, part-time explorer, part-time stamp collector and whole

time good guy has been on the trail of a long lost South American tribe for many a long year. By a strange coincidence, when his plane runs out of fuel over the jungle, he just happens to land at the entrance to the very Aztec temple he was searching for.

Getting in proved to be easy. Getting out at the other end was decidedly more problematical. No account had the door slammed behind him than a huge stone ball starts to chase him down the passage. With no time to change your name from Rick Dangerous to Rick Moss (because as we all know, a rolling stone gathers no moss) (Ha ha, very droll. Get on with it - Dangerous Rick) your only option is to throw yourself off the cliff at the end of the tunnel. Surprise surprise, gravity works in South America too and the ball follows you...

Having eventually dodged out of the way of the evergreen concrete marble, all you have to do now is similarly avoid a series of angry natives, a few snakes and bats, lots of poisonous

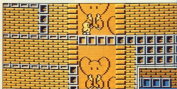
spiked pits and a whole load of spears shooting out the walls, before you finally reach the other end. Then you can try your hand at three other scenarios including a mighty fortress and an Egyptian tomb.

In order to defend yourself, you can poke things with your stick. Timing is all important here and I found the technique useful only against bats. Natives are best dispatched with a swift bullet but you only carry a few of these and the noise they make is all too likely to set off a trap. You will also need dynamite to blast your way past rock falls and the like.

The trouble with this game is the lack of variety. Problems are usually only solved by trial and error - you frequently have to throw yourself into the unknown. Once you have solved that part of the game though, it is unlikely to cause you further stress and soon becomes repetitive. Fun and simple to play, I would suggest that it is overplayed somewhat. It would make a very good budget game.

Gordon Hamilton

NEW ZEALAND STORY



Your chance to become a fully paid up member of the Antipodean rescue service.

Ocean - £9.99 Tape

On the face of it, kiwis are something of a failure. New Zealand's most famous bird, they are totally incapable of flight, not very good at swimming and pretty ugly to boot. They do have one redeeming quality though, they are extremely loyal. So when 18 of Tiki Kiwi's friends are captured by a psychotic walrus, he doesn't hesitate. Armed only with his bow and arrow, he sets off to rescue his friends before they experience a walrus's digestive system from the inside.

The game is a variation on the old ladder and platform theme, but is more the worse for that, having been skillfully converted from the arcade original.

You must reach all of your friends within a certain time allowance. A radar

shows your relative locations and, on the early screens, there are a few helpful arrows to point you in the right direction. Although you only have your bow and arrow to defend yourself with, shooting some of the enemy will force them to drop other, more potent weapons - bombs, bouncing missiles and poisons of temporary invulnerability being examples. Collecting fruit scores bonus points and if you manage to pick up all the letters of the word 'victend', you are granted an extra life.

Malicious bananas, boomerang throwers, evil frogs and vampire bats will all impede your progress and there are also some very large guardian creatures that have to be defeated, not always by orthodox means - the only way to escape

from the whale is to allow yourself to be swallowed first. You are then caught up literally in a shoot 'em!

As well as travelling on land, you will also need to take to the air. As already mentioned though, your wings are not equipped for this purpose so you will need to hijack a balloon to help you. You will also need to watch your oxygen levels when swimming underwater. Drowning is not good for your health!

New Zealand Story is very well presented and is one of those rare games that, although simple to play and easy to get into, is highly addictive. Above all, it is good fun which, when it comes down to it, is what a good game is all about.

Gordon Hamden

Below: Hummel Fried Kiwi, my favourite.



Above: If you need a new best, buy one from us. Two months later we'll send you the bill.

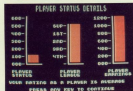
INFO

Gameplay: 95%
Graphics: 75%
Sound: 65%
Lastability: 35%

Overall
80%

The Soccer Squad

Now that the new football season is well under way, the software charts are dominated by football games. Gremlin has fielded a team of four experienced players as its challenge for the top.



Gremlin Graphics - £9.99 Tape

Four games for the price of one is always worth a look as it often offers great value for money. This one bundles together Gremlin football games starting two of the top names in football, Gary Linaker and Roy of the Rovers. However, before you think that all football games are the same, check-out these as each one offers an unique challenge.

Gary Linaker's *Superstar Soccer* is the traditional style of football game with a scrolling side-on view of the pitch and joystick-controlled players. In the game you can take control of the centre forward, goalkeeper and manager - in which you can pick your team from a squad of players and decide team tactics by telling forwards to shoot or pass, and defence to either stay back or support the forwards. Perhaps, the best part of the game is that the forwards don't just shoot at goal willy nilly they can also attempt spectacular goal attempts with headers and overhead kicks if the ball's at the right height.

Gary Linaker's *Super* skills is a selection of training exercises, that include gym training (such as pushups and squat thrusts), field work (including dribbling, clipping and shooting) and ball control - where you must keep the ball off the ground by bouncing it off various parts of your anatomy.

Roy of the Rovers is a curious mix of football action and arcade adventure, as some unscrupulous gang has kidnapped the Manchester Rovers team (just before a big exhibition game that could save the club from

the developer's bulldozers. In a race against time you must avoid enemy superstars, hoodlums, traps and ambushes and find the other four players, otherwise you will have to face the opposition alone.

The fourth game is the intriguing *Footballer of the Year* which plays like a board game and costs you as a 17 year old just entering football. Through taking the limited scoring chances that fall your way in action sequences you will earn money and be spotted by scouts from other teams, gradually taking you from fourth division obscurity to first division and international football, and perhaps the ultimate accolade as the *Footballer of the Year*.

Although together they represent a good footballing package they are, at best, 2nd division games as they lack the quality and depth of the top of the genre.

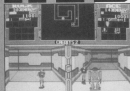
Tony Hetherington

Gremlin Graphics has now moved out of the US Gold stable and back to Sheffield and independence.

INFO

Gameplay: 50%
Graphics: 38%
Sound: 35%
Lastability: 42%
Overall:
41%

XYBOTS



Alas! There's a robot coming at my XY Botton

Enter the heroes, two hatch commands type characters who waddle forth in safety as though suffering from the after effects of a grade A ventilation.

Despite the ridiculous waddle our heroes are men, if a little limited. As they move through the maze complex of the Xybots their progress is shown on a small, colourless section of the screen. This feat typifies two player games of this nature. Although it enhances a game no end to let two players to play simultaneously, the loss of playing

area often spoils the gameplay. And when nearly half the screen is taken up with stats and a map, things become a little tedious. The only advantage in this game when playing with two players is the ability to shoot each other in the back and the combined firepower.

The Xybots are a mechanical race and not confined to the usual limitation of the humble organic body. This means they can move a lot faster, carry more armour and pack twice as much punch into their shots. Despite this advantage and your rapidly dwindling 'power

Domark - £9.99/£12.99

A mechanical menace in the form of the Xybots is assaulting the Earth. All that stands between them and victory are two waddling heroes.

supply you still manage to slaughter the waddlers. This could possibly be due to the artifacts picked up here and there on your travels. Coins can be collected for later purchase of weapons and extra firepower. Energy capsules to keep the body functioning and a host of gadgets to boost your characters abilities.

On level one a little ingenuity is rewarded with the discovery of a teleport pad that takes you directly to level eight. Not only does this allow you to skip the intervening levels but a cache of coins ensures that your character can purchase enough hardware to handle the challenge. If you decide to take the longer route you will be rewarded by a display

of hostile mechanics never before seen on your 64. Small robots fit through the maze moving collectible items, large cannon toting robots guard the passage ways and the infuriating droids with the flags, a killing blow can only be landed on these when their doors are open. The lack of colour makes the remaining flag a little awkward to spot so just count the number of blimps currently in circulation and if the number is greater than your blimp firing capacity remember to dodge.

Remember not to panic when a little sign pops up and points to some danger off to one of your sides, as to turn you need to press the fire button and move the stick; the other way around and you blast the wall.

This is not so much a bad conversion but a bad game which, without the advantages heaped upon it by a dedicated arcade machine, fails to produce goods.

Adrian Pomphrey



INFO

Gameplay: 47%
Graphics: 60%
Sound: 78%
Lastibility: 73%
Overall:
60%

Xybots is one in a range of Tengen conversions by Domark, who currently holds the licence to convert all Tengen releases to home video format for the next three years.

SMOOTH CRIMINAL

If we were to believe everything that we read in our national dailies, not only would we have to revise the size of amoebas, but we would be led to think that Michael Jackson has committed every strange act known to man, short of living on the moon.

Luckily most people have the sense to shun such comments and try to understand the man as a human being. He was born in 1958 in Gary, Indiana, where he, and four of his brothers, formed a band which was to take the world by storm.

The Jackson 5 were first brought to attention in 1968 when they auditioned for Motown Records. And it was their appearance on the Ed Sullivan Show in 1969 that brought them firmly into the public eye. Michael was the lead

Michael Jackson, pop phenomenon or over-publicised eccentric?

Rik Henderson explores the man, his music, his movie and previews the forthcoming game from US Gold.



singer, and was but 9 years of age when they experienced their first number one hit.

When Michael was 12 he recorded "Ben", which was the first solo hit of mine, and it was in 1978 that he split from his family group to explore the world of music, and superstardom, on his own. This was after appearing in the pay remake of *The Wizard of Oz*, entitled *The Wiz*.

Although he was already at this point a star in the genre, the album *Thriller* placed him in the record books. He received 58 platinum records in 29 countries,



MOONWALKER

■ FEATURE

and in America he was awarded no less than 8 Grammy's. To date Thriller has sold over 40 million copies worldwide, and is still selling.

How does one follow that? Easy, one makes ones first feature length movie based on ones own records.

Moonwalker is Michael's first feature length film (having previously only done shorts, such as Thriller) and is titled after his best-selling autobiography — which is named after the dance that he has perfected so well. It deals with all the subjects that Michael has shown as being dear to his heart — youth, friendship, drug abuse, bad journalism, and silliness — and in true fairy-tale fashion, he takes many obstacles and shows how to overcome them (pop kids, this is all believable stuff. If you are confronted by a drug baron and his troops, just transform into a large robot and blow the heck out of them).

The plot follows Michael and three friends (one of which is Sam Lommon) through various sub-plots, all of which are interlinked by Mr. Big — an evil drug baron with an evil haircut. First probe that Mike lives in the journalists at a Hollywood studio, they are hungry for blood and wish to grab some Jackson negatives (any resemblance between those pictures and the outbursts found in Argus is purely intentional).

He manages to elude them by wearing a rabbit mask, and in some smooth puppetry, he speeds away on a motorcycle until he finally escapes their ruthless pencils. This is not the only transformation that he undertakes in Moonwalker.

Like I said earlier, he also transforms himself into a very large Transformer-like robot, and even more unbelievably, a mammoth space ship, to which he finishes the battle with a few deft twirls of his thumbs. Moonwalker is definitely intended for kids, and has many charms which makes it ideal for each an audience.

It also makes it ideal for a computer game. Which is just as well as US Gold has scored the license and will produce Michael Jackson's exploits in time for November, and thus Christmas.

The game follows the plot of the film very closely and is split into 4 levels. The action is played in a maze-like game with a top-down view, although in-between each level there is a moderately large action sequence. It follows all the transformations, climaxing in a VERY large action sequence featuring the Spacehip Jackson.

The music throughout the movie is also going to be converted onto the home computer, with relevant song appearing in relevant sections, and the whole game is going to be very moon-squagen. US Gold is very excited about this project and, with the help of the Ropyunch Corporation of Minneapolis, Moonwalker is likely to be a success Worldwide (much like Michael himself).

If US Gold only sell 1% the amount of copies as the record Red dot, everybody up in Birmingham will be happy little bunnies.





**Andrew Brown, the man
around town, goes to
PCs.**

Welcome to PC Corner, the part of the magazine for all Commodore DOS users, whether fledglings or old hand. This month it's a mixed bag of mainly software reviews, plus an intro to batch files. First though, I'm going to kick off with a couple of news items.

Lotus corp (see Magellan review) has been busy lately. Not only has it got both 123 releases 2.2 and 3.0 onto the streets, but has upgraded the help available through its dealer network. The new system uses a CD-ROM disk called unimaginatively, CD/PROMPT. With over 18,000 pages of information on the disk, that time honored phrase of 'Oh it's not in the manual, we'll have to check with head office' no longer holds any water.

With the Intel 80486 chip now becoming available as upgrades for systems such as the IBM PC2, and AST Premium 386 machines, speculation over prospective upgrades for other machines is rife. It seems however that commodore who only has 286like 386 is not yet to be tempted, or was it caught out? Certainly the much rumoured 386SX machine is on the stocks, but what else?

Batch File Fun

It is often thought that MSDos computers do not have a programming language built in. In fact they do, the so-called Batch language, which really is just an extension of MSDos.

Batch programs are just like those you may have written in Basic, but there are differences. The commands available are somewhat limited, and each program is really a text file. However, some useful things can be done. For example with Autoexec.bat. This is the Batch program that controls the computer at start up, so it's very important. Much can be done with

LIFE'S A DOS

Astrosave.bat, and I may cover the options in future columns, but for now here is a simple model for you single drive users. The following text should be prepared with whatever editor you use, and saved as a text-only file.

```
echo off
path=a: c:
prompt $p$g
copy command.com a:
```

You should also prepare another text file with the following command:

```
Files = 20
Buffers = 20
device = Ramdrive.sys
Set volume = C: command.com
```

First, make a working copy of your boot disk and copy both text files to it. Also copy the file *Ramdrive.sys* to the disk. Rename the first file *Astrosave.bat*, and the second *Config.sys*. Reboot, and everything should go as normal, except for a message similar to this:

```
Microsoft Ramdrive Version 2.01 virtual disk c:
Disk size 64k
Sector size 512 bytes
Allocation unit 1 sectors
Directory entries 64
```

What you have done is created a RAM disk which becomes drive *c:*, and copied *Command.com* to it. You may well be wondering what this will do for you. The answer is that you should no longer see messages like this: *Invalid Command.com*. Insert *Command.com* disk in default drive and strike any key when ready.

Command.com will always be available to the system, and irritating disk swaps kept to a minimum. Hard disk owners can still use this trick incidentally, as it does speed things up somewhat. The one drawback of course being that memory is lost to the system. Note, this is only meant as an example and some programs will not work under this configuration of DOS.

• Typography

Just about everybody these days has heard of DTP, however fewer people actually put the theory into practice. Reasons for this are complex. An important factor has been the gap between low-priced low-performance systems, and the more exclusive Postscript based kit. Some might regard this state of affairs as a bonus, preventing the perpetuation of typographic disasters on the world.

One way of narrowing the gap is to provide the low end user with some of the excellent fonts hitherto only available to Postscript users. This G&T have done, with their Typographic range of outline fonts. The normal way of acquiring these is by purchasing one of the two collections. Prime, consists of Sans, Serif, and Courier which is the equivalent of Helvetica, Times and Courier on Postscript printers. Standard, has all the rest, and is much more interesting, with such things as Zapf Dingbats and Sans Narrow. Together they make up the equivalent of the 13 fonts available as standard on Postscript printers. The two collections come complete with a three ring binder, manual, disks and poster showing the fonts available. Individual fonts are also available.

If you want to make use of the fonts, you have to install them first. This is a clumsy process at best, and irritating at worst. Everything has to be specified from menus and sub-menus, you can't just whisk around the screen selecting items at will. Also, as the program generates bit-mapped fonts, the time taken can be excessive. For example, I specified an extensive range of point sizes from 6 to 72 in a single style of one outline font. Typographic suggested 18 minutes 31 seconds to generate the fonts, which then occupied 3Mbyte on my hard drive. Of this, the 72 point style occupied no less than 1.5Mbyte. Simple mathematics then gave me a figure of 73Mbytes for the six fonts supplied as part of the standard collection. The moral has to be, use the minimum



number of fonts necessary to do the job, unless you have a massive hard disk. Unfortunately you are then severely hampered in your choice of fonts, effectively back to square one. And what happens if you wish to use the fonts with two or three different applications?

On the plus side, a large number of applications and output devices are supported including typesetting machines. These however can only be used if you specify the postscript names for the fonts when generating them.

My overall verdict; a cost-effective way of widening the scope of your DTP work, but really needs a large hard disk to get the most out of it.

Lotus Magellan

Magellan has been hailed as one of a new breed of DOS shells. What's a DOS shell you ask? Strictly speaking, they are a way of controlling DOS without using the system prompt. That includes everything from simple batch programs to MS Windows. A stricter definition however, would add the fact that some part should remain in memory while your programs are running. This allows the main section to be reloaded when your program terminates. By that definition, Magellan is the Rolls Royce of DOS shells. It has elements of artificial intelligence with its 'fuzzy' search routine and 'Hypertext' facilities that allow you to treat all the files on disk as one enormous database.

Magellan builds an index of files stored on your hard disk, known from a list of templates what is in those files displaying the contents accordingly. Dbase and Lotus 123 files are just two types it knows about.

You can search for data in files in several ways using the Explore option. Magellan's file viewer allows it to display the contents of the files in a form near to that of the creating applications. Thus Lotus 123 files are displayed in row and column format, Dbase files as tables, and so on. Launch (F7) is another powerful command, because it not only allows you to start up programs from within Magellan, but also gives extensive control over the process. It does this by making use of the powerful Macro facility built into Magellan. Of course it's not perfect, but it could save you a lot of key strokes over the year.

All the other facilities, such as copying, deleting, renaming and printing files are also present, and as you would expect from such a polished product are well implemented.

Documentation is probably the most scrupulous I have ever seen. There is a ring bound manual, plus two small booklets, and all rock of class. However I found the content pedestrian, if thorough. Full marks though for Index and Glossary, essential for this kind of product.

Magellan is a well finished program, but what will be its use? Clearly Lotus intends the product to fit in with its current base of corporate 123 users, but who else? Certainly anyone who needs to organise their hard disk, or where a number of people need to access data on one machine. But, the kind of disorganised people who do need Magellan are, by definition, the first likely to purchase it.

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EXCLUSIVE STEVE BELL INTERVIEW

ZEKE MAN WORLD MILES

**Rik Henderson, the man in the dayglo
tights, deals a severe dose of comic
capers!**

comic, Lady (fall), Oh or like comedy (actor, spend) designed to amuse, fictions, burlesque, funny, (sweep, paper, history of Rome, incident) 2nd/edn, i. Comedian, paper theories, potential publication full of horrors, at a (-ly), ninth-provoking, queer, odd, ally a, l. i. Gh (Kamus revert)

- The Pocket Oxford Dictionary, Fifth Edition

Although everybody must have a vague idea of what a comic is, I find the dictionary entry above contains a phrase which sums up its definition perfectly. "Pictorial publication full of horrors" may not say "Stanza" to you, but we're moving into the 1990s. And the comic industry is coming with us.

Long gone are the days when children flocked to the newsagents to see if Spiderman had vanquished Doctor Octopus (again) and if Superman had pulverised Lex Luthor (again). Now dark landscapes are the settings for brutal crimes and many vapourware keep their boxer shorts inside their trousers. Batman has acquired weaponry (and lost a partner). Dan Dare (the great, great, great, etc. grandson of the original that is) has died and been resurrected. And even Judge Dredd has turned from being a fascist psychotic killer into an old fascist psychotic killer.

This can be put down to one thing: Comics are no longer for children only. A fact that became apparent when *Viz* was launched in December 1979. The publishers now claim to sell around 300,000 copies every two months. The content is crude, barbaric, and at best can be described as toilet humour, which goes half way to explaining why I (and another 799,999 dedicated readers) love it so much.



Another recent comic which has reformed one famous character to a more adult status is 'The Dark Knight Returns'. Written by Frank Miller - who is, at this very moment, writing the script and screenplay for *Batman Returns* 2 - it looks at the later of Batman, and plots a firing call to the aged crusader's career. Many scenes from *The Dark Knight* were converted into cellular format via Tim Burton's *Batman* masterpiece, thus proving what a strong plot Frank had devised.

But these were just the first of the 'mature' readers comic. There was an enormous flood of them in 1987 and '88, and we can expect many more to come. One other of honourable note is 'Watchmen' by British comic author Alan Moore. It examines superheroes in a realistic society and comes to the conclusion that heroism is something frowned upon by a majority of 'real' people. Of course, like *Dark Knight* became *Batman*, Terry Gilliam has already signed on the dotted line to convert this piece of comic literature onto the cinema screen.

Both of these products came from American-based DC Comics. There are of course many British comics that hold their own in the UK market. One such comic is *2000AD*. Founded in 1977, it sought to replace *The Eagle* as a space-age action paper for young and old. Fortunately it did far more than that.

It has established itself at the top of it's kind (although competition is very scarce) and it's characters are now household names (in my household anyway!). As from it's 650th issue, they should all become household names in America too, as it will be in the shops there at the same time as here.

Also under the *2000AD* name is *Crisis*, a comic that seeks to educate whilst remaining enjoyable and not too heavy. Dealing with political and social values, it is incredibly well-drawn and it is a rare comic that will get me into a newspaper ready to receive a copy.



VIZ

PRINCE CHARLES NAMED IN BIZARRE

Another new magazine to come our way is *Deadline*, which is edited by one of 2000 AD's greatest artists. It can be described as a more down-to-earth, pop-culture version of 2000 AD, more than anything else, and it seems to be doing extremely well. Having just held it's first birthday party at the Lincolntown London's West End, it contains several strips, such as the new infamous 'Tank Girl' by Jamie Hewlett, and a few interviews and features on up-to-the-minute items. *Deadline* is monthly and is damn highly recommended.

While DC are working to update their characters, Marvel haven't quite got the idea yet. That said, Marvel UK has recently released an amusing little monthly titled 'The Glass Brother'. This is a sort of *Bliss Brothers* in the future. It follows the exploits of two private eyes in a city full of debauchery, crime, art and violence (although not necessarily in that order). It is very humorous and is well worth picking up.

The software houses have also decided to capitalise on the rise in popularity of comics. Virgin Mastertronic has announced two games based on famous characters - *Spider-Force* is based on the Marvel superhero of the same name (he's alien and he's got a wackling great ear! based on which he can fly!), and their second honour is *Viz*. They say that the latter will not be based down as this may ruin the feel of the game, but the cover will display a sign to the effect of 'mature gamers only'.

Gotham, of course, has Batman - the movie, but it also has the right to *Watchmen*.

The Edge has *The Punisher* in vigilante duties by his family's death at the hands of a crime organisation) and *The X-Men* (a superhero troupe containing many rough and ready characters). It has also announced a few more to come next year - *Daredevil* (a blind superhero who is anti-drugs, and just about and everything else as well), and *Wolverine* (a character who has large, very sharp claws that he can extend from his knuckles).

Empire has *Doctor Doom's Revenge*, which is based around the Fantastic Four's villain and most feared enemy.

Warner also has it that there will be new games based on (well for all: *Captain America*, *Judge Dredd*, *The Swamp Thing*, *X-Files*, *The New Mutants*, and *Rogue Trooper*). We can be guaranteed though that this will not be the end, there is a whole universe of licences just waiting to be grabbed.

Roger Mellie



He Plan On Telly



2000 AD
PRINCE CHARLES NAMED IN BIZARRE





YOUR PROGRAMMER

CONTENTS

36 Sprite Priorities

Automatic control for sprite positions, as they wander the screen.

37 VAT Number Checker

Is that invoice valid? Check the VAT number printed with our easy-to-use program.

39 Moving the Screen

Relocate the screen in memory.

41 Special FX

Fade your text in and out, and produce effects for your programs.

43 String Along

Making use of the three basic functions.

45 Extending Basic 8

The eighth part of our on-going series, as it nears its impending end.

49 Peeplock

Keep your privacy private with this security program.

50 The User Port

Use the user port.

How to use the pull-out...

Remove from magazine and cut spine. Punch holes where indicated and insert in a ring binder for easy storage and long-term protection.

If you want to achieve a truly three-dimensional quality to your sprites here is an incredibly useful routine for you to use. It's very short, so there isn't endless lists of data to type in.

Examples of three-dimensional sprites which spring to mind are the various sport simulations, such as 'International Soccer'.

As you probably know, sprites have a definite priority arrangement: is that the lower the sprite number

Make use of the priority properties of your sprites

By J. Simpson

SPRITE PRIORITIES

the higher is its priority. This means that sprite 0 has the highest, through to sprite 7 which has the lowest.

Sprites with higher priority always display in front of those with a lower priority. This is fixed within the hardware of the VIC II chip, which means if you want to create a three-dimensional illusion, then a routine needs to be constructed which will manage the sprites by keeping 'foreground' sprites higher in priority.

To handle this, I decided that sprites lower down the screen would be considered as 'foreground' to those higher up the screen. I'm sure you know that the pixel map is arranged with the 'Y' coordinate running from 0 at the top of the screen, to 255 at the bottom. The Machine Language routine, **SPRITE PRIORITIES**, uses the 'Y' coordinate information to decide which sprite should be shown; the sprite with the greater 'Y' value becoming sprite 0, and so on.

Within the routines

1. SPRITE PRIORITIES this is the ML routine which deals with checking and updating all the sprite positions and their priorities. If a sprite moves up the screen (or backwards into the picture), and is doing so it passes above (or behind) another sprite, then **sprite priorities** will swap the two sprites around, together with all data relevant to each (ie: Image, Xpos, Ypos, Xpos, Colours etc). This neatly holds together the illusion that a sprite's priority is changing - first passing in front of, then behind another sprite. This does, however, pose a tricky problem! Let's say that the joystick is being used to control one particular

image; are simple colored blocks. Their default values are:

Block 1 = White
Block 2 = Red
Block 3 = Cyan
Block 4 = Purple
Block 5 = Green
Block 6 = Blue
Block 7 = Yellow
Block 8 = Orange

You can use the numerical keys (1-8) to select any one of the eight blocks. That block will now be under **CONTROL**, and can be manipulated around the screen using the joystick plugged into port 2.

If you study the listing, you will see that in the **INITIALISE** routine lines 68-70 variables 'Y' and 'X' have been declared, and the two arrays P() and D8() dimensioned. At line 76 the arrays are filled - P() with 0 to 7 and D8() with the 'Y' coordinate value of each sprite, from 0 to 7.

sprite element. Normally that control would be defined and controlled using one particular sprite - say, sprite 0. All that needs to be done is to peek and poke (ie ML equivalent) with 'Y' coordinate information into sprite 0. However, should sprite 0 move up the screen and pass the next sprite, then **CONTROL** shifts to sprite 1, and if **CONTROL** carries on up the screen it might become sprite 2, 3, 4, 5, 6 or 7.

2. BASIC DEMO - For programmers, and to show the system working, the basic demo program outlines a demonstration of **SPRITE PRIORITIES** in action, as well as useful routines for the controlling of which sprites are shown. When you 'RUN' the program (that is after loading **SPRITE PRIORITIES**, and typing 'NEW'), then loading **BASIC DEMO**, eight sprites are displayed diagonally across the screen. The

The array P() holds the current position of the BLOCK (not the sprite) on the screen, and D8() - which derives from 'Dummy sprite' - holds the current 'Y' location of where each sprite would be, should there be no **SPRITE PRIORITIES** manipulation.

The variable 'X' is used to shift joystick **CONTROL** over the block selected from the numerical key input. A loop-checks through the P() array to find the current screen position in relationship to the sprite. For example, **BLOCK 1** might be at the bottom of the screen, and so it would be sprite 0. Where 'X' is set to equal the actual sprite value - in the foregoing example, 8. When the joystick is moved up or down, program control will call either **JOYSTICK UP** (commencing at line 21) or **JOYSTICK DOWN** (line 32). Let's say 'up' is the selection. First D8(X) is decremented (X=Block being moved), and the screen

[illegible][illegible]

NUMBER CHECKER

M. V. R. ELLI

really does go go the Tasmanian? Are you worried that the plumber's bill, scrawled in pencil on the back of a

cigarette packet, may not be guessed? Well, sorry no more! With the aid of this simple little Basic program,

you can now know for sure that the firms you deal with are decent, honest and true. Well, actually you can only use it to find out whether the VAT numbers they put on their invoices are genuine or not. But this does go quite a long way towards proving their credentials. You will, once you start using this program as a regular part of your book-keeping routine, sleep more easily at night, safe in the knowledge that you haven't forked out fifteen per cent over the odds for your goods, and that the Taxman won't be claiming you've cheated him with phony invoices.

The program is written in Basic, and will run on the C64, C128, Plus 4 and C16. To use it, simply enter the nine digit VAT number and press return. The program will respond with the appropriate message:

VAT number is valid

or

VAT number is not valid

Simply that! The program is foolproof, objecting to any input which is not a nine digit number. If such an input is attempted, an appropriate error message will be

printed before the program reports that the VAT number is not valid.

The program is in two parts, to make calculation or integration as a sub-routine into your own programs easier. The first part, lines 100 to 180, inputs the VAT number, sends it to the sub-routine that actually checks the number, and then interprets and prints the result. It then asks whether the user wishes to check another number. If they do, the process is repeated. If not, the program ENDS on line 180. The second part of the program, lines 200-260, contains the checking routine itself.

The checking routine returns the result of its check in two variables: V and E. If V=0, the VAT number is not valid. If V=1, the VAT number is valid. However, before the validity of the number is checked, the input itself is checked for errors. If E is not equal to zero upon return from the routine, it means that such an error has been detected. If E=1 the input contains less than nine characters (the length of any VAT number). If E=2 the input contains more than nine characters. If E=3 the input contains non-numeric characters. If any of these errors are detected, V is always set to zero, since the input could not have been a genuine VAT number. It should be

noted that spaces are stripped from the input before it is checked. This usefully enables VAT numbers to be input inclusive of spaces, as they so often appear on invoices. Upon return from the sub-routine, V\$ will contain the original input, stripped of spaces.

The whole program can be turned into a single sub-routine by simply replacing END in line 180 with RETURN. However, should you wish to use only the checking sub-routine (lines 200-260), then the VAT number to be checked must first be put into A\$ before executing a GOSUB in the routine. As we have seen, the result of the check will be returned in variables V and E. Since there are no GOTOs within the checking sub-routine, reentering it for incorporation into one's own programs is simplicity itself.

The calculation used in this program has been extensively tested, and is a form of the calculation used by the Tax Office to create the VAT numbers in the first place. For obvious reasons, it was thought rather counter-productive to include that calculation in this program. As an incidental observation, it would appear that using their present system, it is only possible for the Tax Office to issue a maximum of two million VAT numbers.



PROGRAM: VAT CHECKER

```

20 100 REM * * * VAT NUMBER CHE
    CKER * * *
21 310 ES(1)="TOO FEW",ES(2)="T
    OO MANY",ES(3)="NON-NUMERIC"

40 180 AB="":INPUT"ENTER VAT NU
    MBER";AB:IFAB=""THENPRINT"NO
    INPUT":GOTO150
22 130 COSUB200:IFEX<>0THENPRINT
    "ERROR: INPUT HAS "ES(3)" CH
    ARACTERS"
71 140 PRINT"VAT NUMBER IS "LEF
    T$;"NOT ",AB$(V+(U-Q))"UALL
    I Q"

23 150 PRINT"TRY AGAIN (Y/N) ?
    "
24 160 GET$;IFC$<>"Y"ANDC$<>"N
    "THEN150
25 170 PRINTC$:IFC$="Y"THEN120
31 180 END
26 200 REM * * * CHECK ROUTINE
    * * *

41 210 UB="":FORA=1TOLEN(C$):UB
    =UB+MID$(C$,A,1):MID$(C$,A,
    1)>" ":NEXT
12 220 U=0:E=0:D=0:IFLEN(UB)<>9
    THEN=ABS(LEN(UB)-9)+1:RETRU
    N
33 230 FORA=1TO9:IFA(UB)THENB=B+U
    AL(MID$(UB,A,1)):C$=A
07 240 IFMID$(UB,A,1)<"0"ORMID$
    (UB,A,1)>"9"THEN=3:A=B
78 250 NEXT:IFEX<>0THENRETURN
27 260 U=ABS(B-INT(B/9))+1:*97
    )=VAL(MID$(UB,2)):RETURN

```


MOVING THE SCREEN

by Ewan Villiers

There are many great myths in the world such as Atlantis, UFO's and, probably the greatest of them all, the difficulty of moving the text and character memory round. This program has been written to end the last of those myths.

Moving the text screen has many uses, take for example menus in adventures and windows in word processors. These must not harm the text beneath them and one method of doing this is to move the screen under interrupts (if the menu isn't over the text it can't harm it). This program will also allow you to make small alterations to the character set without needing to use a character designer.

I have included two versions of this program in the listings. The first is a machine code version (for speed) and the second a Basic listing (for ease of understanding). All busy readers should note that the Basic listing can be typed in and compiled to save messing around with data statements.

The programme requires 3 variables:-

1. A Complex Interface Adapter Bank (CIA)
2. A screen pointer within the bank
3. A character pointer

THE CIA BANK:

The chip which looks at the memory can only 'see' 16K at one time so this sets the block to be 'seen'.

SCREEN POINTER:

The C.I.A. bank picks out a block of 16K. The screen pointer cuts this into 1K blocks which mark the start of each screen.

CHARACTER POINTER:

This is like the screen pointer except that, as the primary character set is 2K long, it is cut into 2K blocks (I haven't copied the second set so try changing it when you run the program).

This is all you need to know to run the program (the addresses of the parameters are in the listings). But if you wish to understand the program, read on.

Changing the C.I.A. BANK (lines 270-290)

The first thing to note about this is that the bank numbers run in the wrong order. The number 0 denotes the fourth block (48132-49331) and the number 3 denotes the first block (0-16384). This is sorted on line 88 by subtracting three from the bank number.

It should also be noted that before the bank can be changed, the C.I.A. must be set for input. This is done by OR'ing 36078 (and 252) with the

bank number (0-3). The only thing left to do is to inform the ROM that you have moved the screen (it is another bank now). The location 648 holds the screen address divided by 255. To inform the ROM, you need to OR 648 (and 63) with 64* the value bank. Once this is done the bank is changed and you can change the screen address.

Changing the Screen Address (lines 340-35)

This is easier than changing the C.I.A. bank. The upper 4 bits of address 53272 hold the screen pointer so you just OR 53272 (and 15) with 16* the screen pointer. Again, the ROM must be informed of the screen's movement. This is accomplished by OR'ing 648 (and 182) with 4* the screen pointer. The screen has now been moved and you can now move the character set.

Changing the character address (line 400)

This is the easiest part of the program. The lower 4 bits of 53272 hold the character pointer. As the character pointer runs in 2K blocks, twice the pointer is stored there. This is done by OR'ing 53272 (and 241) with 2* the character pointer.

The C.I.A. screen and character have now been moved but you still can't use this program because you have not copied the character set yet.

Copying the character data (lines 100-230)

While this is not difficult, it is the most difficult part of this program.

The difficulty is in looking at the character ROM and making sure you are not interrupted, and the other is to address 56334, to ensure that you are not interrupted, and the other to address it to allow you to look at the character ROM. The rest of this part of the program just copies memory and sets addresses 1 and 56334 back to their original values.

128 Users

(Doing this in Basic is much easier for 128 users. The process of copying the character ROM only requires you to use the command Bank 14 to gain access to the character ROM but a full guide to this can be found on pages 260-263 of the 128 reference guide.

The Machine code program

This is a short program encoded in data statements which has only 2 major differences from the Basic program.

The first difference is that while in the basic program numbers are entered from 0 to 9, in the machine code version they must be in the form 0 to N or the program will not work.

The second difference is in the order of the subroutines. In this program, the screen moving routine is last, so it can be called upon independently by an SYS command (SYS40064).

The position of the parameters (addresses 49132-54) is shown in the listing, as are the SYS addresses, so all I can say now is "happy programming".

		170:V,PH,VL,HL,DL,LP			
		180:100,173,104,100,41,10,0		100:000 *****	
		190:141,14,100,170,0,100,10		200:000 = Copy characters	*
				210:000 *****	
10:000 *****					
20:000 = 100:4004 to screen 0	*			220:000000,PH,VL,HL,DL,LP	
30:000 = 100:4004 to screen screen	*				
40:000 = 4004 to screen pos 10-100	*			230:0000,PH,VL,HL,DL,LP	
50:000 = 4004 to character pos 10-100	*				
60:000 = 4004 = C.L.L. bank 10-10	*			240:0000,PH,VL,HL,DL,LP	
70:000 = Program mode on 4004	*				
80:000 *****				250:0000,PH,VL,HL,DL,LP	
90:000 = 0 to 101 = 1004 = 0	*			260:0000,PH,VL,HL,DL,LP	
100:0000,PH,VL,HL,DL,LP				270:0000,PH,VL,HL,DL,LP	
110:0000,PH,VL,HL,DL,LP				280:0000,PH,VL,HL,DL,LP	
120:0000,PH,VL,HL,DL,LP				290:0000,PH,VL,HL,DL,LP	
130:0000,PH,VL,HL,DL,LP				300:0000,PH,VL,HL,DL,LP	
140:0000,PH,VL,HL,DL,LP				310:0000,PH,VL,HL,DL,LP	
150:0000,PH,VL,HL,DL,LP				320:0000,PH,VL,HL,DL,LP	
160:0000,PH,VL,HL,DL,LP				330:0000,PH,VL,HL,DL,LP	
170:0000,PH,VL,HL,DL,LP				340:0000,PH,VL,HL,DL,LP	
180:0000,PH,VL,HL,DL,LP				350:0000,PH,VL,HL,DL,LP	
190:0000,PH,VL,HL,DL,LP				360:0000,PH,VL,HL,DL,LP	
200:0000,PH,VL,HL,DL,LP				370:0000,PH,VL,HL,DL,LP	
210:0000,PH,VL,HL,DL,LP				380:0000,PH,VL,HL,DL,LP	
220:0000,PH,VL,HL,DL,LP				390:0000,PH,VL,HL,DL,LP	
230:0000,PH,VL,HL,DL,LP				400:0000,PH,VL,HL,DL,LP	
240:0000,PH,VL,HL,DL,LP				410:0000,PH,VL,HL,DL,LP	
250:0000,PH,VL,HL,DL,LP				420:0000,PH,VL,HL,DL,LP	
260:0000,PH,VL,HL,DL,LP				430:0000,PH,VL,HL,DL,LP	
270:0000,PH,VL,HL,DL,LP				440:0000,PH,VL,HL,DL,LP	
280:0000,PH,VL,HL,DL,LP				450:0000,PH,VL,HL,DL,LP	
290:0000,PH,VL,HL,DL,LP				460:0000,PH,VL,HL,DL,LP	
300:0000,PH,VL,HL,DL,LP				470:0000,PH,VL,HL,DL,LP	
310:0000,PH,VL,HL,DL,LP				480:0000,PH,VL,HL,DL,LP	
320:0000,PH,VL,HL,DL,LP				490:0000,PH,VL,HL,DL,LP	
330:0000,PH,VL,HL,DL,LP				500:0000,PH,VL,HL,DL,LP	
340:0000,PH,VL,HL,DL,LP				510:0000,PH,VL,HL,DL,LP	
350:0000,PH,VL,HL,DL,LP				520:0000,PH,VL,HL,DL,LP	
360:0000,PH,VL,HL,DL,LP				530:0000,PH,VL,HL,DL,LP	
370:0000,PH,VL,HL,DL,LP				540:0000,PH,VL,HL,DL,LP	
380:0000,PH,VL,HL,DL,LP				550:0000,PH,VL,HL,DL,LP	
390:0000,PH,VL,HL,DL,LP				560:0000,PH,VL,HL,DL,LP	
400:0000,PH,VL,HL,DL,LP				570:0000,PH,VL,HL,DL,LP	
410:0000,PH,VL,HL,DL,LP				580:0000,PH,VL,HL,DL,LP	
420:0000,PH,VL,HL,DL,LP				590:0000,PH,VL,HL,DL,LP	
430:0000,PH,VL,HL,DL,LP				600:0000,PH,VL,HL,DL,LP	
440:0000,PH,VL,HL,DL,LP				610:0000,PH,VL,HL,DL,LP	
450:0000,PH,VL,HL,DL,LP				620:0000,PH,VL,HL,DL,LP	
460:0000,PH,VL,HL,DL,LP				630:0000,PH,VL,HL,DL,LP	
470:0000,PH,VL,HL,DL,LP				640:0000,PH,VL,HL,DL,LP	
480:0000,PH,VL,HL,DL,LP				650:0000,PH,VL,HL,DL,LP	
490:0000,PH,VL,HL,DL,LP				660:0000,PH,VL,HL,DL,LP	
500:0000,PH,VL,HL,DL,LP				670:0000,PH,VL,HL,DL,LP	
510:0000,PH,VL,HL,DL,LP				680:0000,PH,VL,HL,DL,LP	
520:0000,PH,VL,HL,DL,LP				690:0000,PH,VL,HL,DL,LP	
530:0000,PH,VL,HL,DL,LP				700:0000,PH,VL,HL,DL,LP	
540:0000,PH,VL,HL,DL,LP				710:0000,PH,VL,HL,DL,LP	
550:0000,PH,VL,HL,DL,LP				720:0000,PH,VL,HL,DL,LP	
560:0000,PH,VL,HL,DL,LP				730:0000,PH,VL,HL,DL,LP	
570:0000,PH,VL,HL,DL,LP				740:0000,PH,VL,HL,DL,LP	
580:0000,PH,VL,HL,DL,LP				750:0000,PH,VL,HL,DL,LP	
590:0000,PH,VL,HL,DL,LP				760:0000,PH,VL,HL,DL,LP	
600:0000,PH,VL,HL,DL,LP				770:0000,PH,VL,HL,DL,LP	
610:0000,PH,VL,HL,DL,LP				780:0000,PH,VL,HL,DL,LP	
620:0000,PH,VL,HL,DL,LP				790:0000,PH,VL,HL,DL,LP	
630:0000,PH,VL,HL,DL,LP				800:0000,PH,VL,HL,DL,LP	
640:0000,PH,VL,HL,DL,LP				810:0000,PH,VL,HL,DL,LP	
650:0000,PH,VL,HL,DL,LP				820:0000,PH,VL,HL,DL,LP	
660:0000,PH,VL,HL,DL,LP				830:0000,PH,VL,HL,DL,LP	
670:0000,PH,VL,HL,DL,LP				840:0000,PH,VL,HL,DL,LP	
680:0000,PH,VL,HL,DL,LP				850:0000,PH,VL,HL,DL,LP	
690:0000,PH,VL,HL,DL,LP				860:0000,PH,VL,HL,DL,LP	
700:0000,PH,VL,HL,DL,LP				870:0000,PH,VL,HL,DL,LP	
710:0000,PH,VL,HL,DL,LP				880:0000,PH,VL,HL,DL,LP	
720:0000,PH,VL,HL,DL,LP				890:0000,PH,VL,HL,DL,LP	
730:0000,PH,VL,HL,DL,LP				900:0000,PH,VL,HL,DL,LP	
740:0000,PH,VL,HL,DL,LP				910:0000,PH,VL,HL,DL,LP	
750:0000,PH,VL,HL,DL,LP				920:0000,PH,VL,HL,DL,LP	
760:0000,PH,VL,HL,DL,LP				930:0000,PH,VL,HL,DL,LP	
770:0000,PH,VL,HL,DL,LP				940:0000,PH,VL,HL,DL,LP	
780:0000,PH,VL,HL,DL,LP				950:0000,PH,VL,HL,DL,LP	
790:0000,PH,VL,HL,DL,LP				960:0000,PH,VL,HL,DL,LP	
800:0000,PH,VL,HL,DL,LP				970:0000,PH,VL,HL,DL,LP	
810:0000,PH,VL,HL,DL,LP				980:0000,PH,VL,HL,DL,LP	
820:0000,PH,VL,HL,DL,LP				990:0000,PH,VL,HL,DL,LP	
830:0000,PH,VL,HL,DL,LP				1000:0000,PH,VL,HL,DL,LP	
840:0000,PH,VL,HL,DL,LP				1010:0000,PH,VL,HL,DL,LP	
850:0000,PH,VL,HL,DL,LP				1020:0000,PH,VL,HL,DL,LP	
860:0000,PH,VL,HL,DL,LP				1030:0000,PH,VL,HL,DL,LP	
870:0000,PH,VL,HL,DL,LP				1040:0000,PH,VL,HL,DL,LP	
880:0000,PH,VL,HL,DL,LP				1050:0000,PH,VL,HL,DL,LP	
890:0000,PH,VL,HL,DL,LP				1060:0000,PH,VL,HL,DL,LP	
900:0000,PH,VL,HL,DL,LP				1070:0000,PH,VL,HL,DL,LP	
910:0000,PH,VL,HL,DL,LP				1080:0000,PH,VL,HL,DL,LP	
920:0000,PH,VL,HL,DL,LP				1090:0000,PH,VL,HL,DL,LP	
930:0000,PH,VL,HL,DL,LP				1100:0000,PH,VL,HL,DL,LP	
940:0000,PH,VL,HL,DL,LP				1110:0000,PH,VL,HL,DL,LP	
950:0000,PH,VL,HL,DL,LP				1120:0000,PH,VL,HL,DL,LP	
960:0000,PH,VL,HL,DL,LP				1130:0000,PH,VL,HL,DL,LP	
970:0000,PH,VL,HL,DL,LP				1140:0000,PH,VL,HL,DL,LP	
980:0000,PH,VL,HL,DL,LP				1150:0000,PH,VL,HL,DL,LP	
990:0000,PH,VL,HL,DL,LP				1160:0000,PH,VL,HL,DL,LP	
1000:0000,PH,VL,HL,DL,LP				1170:0000,PH,VL,HL,DL,LP	
1010:0000,PH,VL,HL,DL,LP				1180:0000,PH,VL,HL,DL,LP	
1020:0000,PH,VL,HL,DL,LP				1190:0000,PH,VL,HL,DL,LP	
1030:0000,PH,VL,HL,DL,LP				1200:0000,PH,VL,HL,DL,LP	
1040:0000,PH,VL,HL,DL,LP				1210:0000,PH,VL,HL,DL,LP	
1050:0000,PH,VL,HL,DL,LP				1220:0000,PH,VL,HL,DL,LP	
1060:0000,PH,VL,HL,DL,LP				1230:0000,PH,VL,HL,DL,LP	
1070:0000,PH,VL,HL,DL,LP				1240:0000,PH,VL,HL,DL,LP	
1080:0000,PH,VL,HL,DL,LP				1250:0000,PH,VL,HL,DL,LP	
1090:0000,PH,VL,HL,DL,LP				1260:0000,PH,VL,HL,DL,LP	
1100:0000,PH,VL,HL,DL,LP				1270:0000,PH,VL,HL,DL,LP	
1110:0000,PH,VL,HL,DL,LP				1280:0000,PH,VL,HL,DL,LP	
1120:0000,PH,VL,HL,DL,LP				1290:0000,PH,VL,HL,DL,LP	
1130:0000,PH,VL,HL,DL,LP				1300:0000,PH,VL,HL,DL,LP	
1140:0000,PH,VL,HL,DL,LP				1310:0000,PH,VL,HL,DL,LP	
1150:0000,PH,VL,HL,DL,LP				1320:0000,PH,VL,HL,DL,LP	
1160:0000,PH,VL,HL,DL,LP				1330:0000,PH,VL,HL,DL,LP	
1170:0000,PH,VL,HL,DL,LP				1340:0000,PH,VL,HL,DL,LP	
1180:0000,PH,VL,HL,DL,LP				1350:0000,PH,VL,HL,DL,LP	
1190:0000,PH,VL,HL,DL,LP				1360:0000,PH,VL,HL,DL,LP	
1200:0000,PH,VL,HL,DL,LP				1370:0000,PH,VL,HL,DL,LP	
1210:0000,PH,VL,HL,DL,LP				1380:0000,PH,VL,HL,DL,LP	
1220:0000,PH,VL,HL,DL,LP				1390:0000,PH,VL,HL,DL,LP	
1230:0000,PH,VL,HL,DL,LP				1400:0000,PH,VL,HL,DL,LP	
1240:0000,PH,VL,HL,DL,LP				1410:0000,PH,VL,HL,DL,LP	
1250:0000,PH,VL,HL,DL,LP				1420:0000,PH,VL,HL,DL,LP	
1260:0000,PH,VL,HL,DL,LP				1430:0000,PH,VL,HL,DL,LP	
1270:0000,PH,VL,HL,DL,LP				1440:0000,PH,VL,HL,DL,LP	
1280:0000,PH,VL,HL,DL,LP				1450:0000,PH,VL,HL,DL,LP	
1290:0000,PH,VL,HL,DL,LP				1460:0000,PH,VL,HL,DL,LP	
1300:0000,PH,VL,HL,DL,LP				1470:0000,PH,VL,HL,DL,LP	
1310:0000,PH,VL,HL,DL,LP				1480:0000,PH,VL,HL,DL,LP	
1320:0000,PH,VL,HL,DL,LP				1490:0000,PH,VL,HL,DL,LP	
1330:0000,PH,VL,HL,DL,LP				1500:0000,PH,VL,HL,DL,LP	
1340:0000,PH,VL,HL,DL,LP				1510:0000,PH,VL,HL,DL,LP	
1350:0000,PH,VL,HL,DL,LP				1520:0000,PH,VL,HL,DL,LP	
1360:0000,PH,VL,HL,DL,LP				1530:0000,PH,VL,HL,DL,LP	
1370:0000,PH,VL,HL,DL,LP				1540:0000,PH,VL,HL,DL,LP	
1380:0000,PH,VL,HL,DL,LP				1550:0000,PH,VL,HL,DL,LP	
1390:0000,PH,VL,HL,DL,LP				1560:0000,PH,VL,HL,DL,LP	
1400:0000,PH,VL,HL,DL,LP				1570:0000,PH,VL,HL,DL,LP	
1410:0000,PH,VL,HL,DL,LP				1580:0000,PH,VL,HL,DL,LP	
1420:0000,PH,VL,HL,DL,LP				1590:0000,PH,VL,HL,DL,LP	
1430:0000,PH,VL,HL,DL,LP				1600:0000,PH,VL,HL,DL,LP	
1440:0000,PH,VL,HL,DL,LP				1610:0000,PH,VL,HL,DL,LP	
1450:0000,PH,VL,HL,DL,LP				1620:0000,PH,VL,HL,DL,LP	
1460:0000,PH,VL,HL,DL,LP				1630:0000,PH,VL,HL,DL,LP	
1470:0000,PH,VL,HL,DL,LP				1640:0000,PH,VL,HL,DL,LP	
1480:0000,PH,VL,HL,DL,LP				1650:0000,PH,VL,HL,DL,LP	
1490:0000,PH,VL,HL,DL,LP				1660:0000,PH,VL,HL,DL,LP	
1500:0000,PH,VL,HL,DL,LP				1670:0000,PH,VL,HL,DL,LP	
1510:0000,PH,VL,HL,DL,LP				1680:0000,PH,VL,HL,DL,LP	
1520:0000,PH,VL,HL,DL,LP				1690:0000,PH,VL,HL,DL,LP	
1530:0000,PH,VL,HL,DL,LP				1700:0000,PH,VL,HL,DL,LP	
1540:0000,PH,VL,HL,DL,LP				1710:0000,PH,VL,HL,DL,LP	
1550:0000,PH,VL,HL,DL,LP				1720:0000,PH,VL,HL,DL,LP	
1560:0000,PH,VL,HL,DL,LP				1730:0000,PH,VL,HL,DL,LP	
1570:0000,PH,VL,HL,DL,LP				1740:0000,PH,VL,HL,DL,LP	
1580:0000,PH,VL,HL,DL,LP				1750:0000,PH,VL,HL,DL,LP	
1590:0000,PH,VL,HL,DL,LP				1760:0000,PH,VL,HL,DL,LP	
1600:0000,PH,VL,HL,DL,LP				1770:0000,PH,VL,HL,DL,LP	
1610:0000,PH,VL,HL,DL,LP				1780:0000,PH,VL,HL,DL,LP	
1620:0000,PH,VL,HL,DL,LP				1790:0000,PH,VL,HL,DL,LP	
1630:0000,PH,VL,HL,DL,LP				1800:0000,PH,VL,HL,DL,LP	
1640:0000,PH,VL,HL,DL,LP				1810:0000,PH,VL,HL,DL,LP	
1650:0000,PH,VL,HL,DL,LP				1820:0000,PH,VL,HL,DL,LP	
1660:0000,PH,VL,HL,DL,LP				1830:0000,PH,VL,HL,DL,LP	
1670:0000,PH,VL,HL,DL,LP				1840:0000,PH,VL,HL,DL,LP	
1680:0000,PH,VL,HL,DL,LP				1850:0000,PH,VL,HL,DL,LP	
1690:0000,PH,VL,HL,DL,LP				1860:0000,PH,VL,HL,DL,LP	
1700:0000,PH,VL,HL,DL,LP				1870:0000,PH,VL,HL,DL,LP	
1710:0000,PH,VL,HL,DL,LP				1880:0000,PH,VL,HL,DL,LP	
1720:0000,PH,VL,HL,DL,LP				1890:0000,PH,VL,HL,DL,LP	
1730:0000,PH,VL,HL,DL,LP				1900:0000,PH,VL,HL,DL,LP	
1740:0000,PH,VL,HL,DL,LP				1910:0000,PH,VL,HL,DL,LP	
1750:0000,PH,VL,HL,DL,LP				1920:0000,PH,VL,HL,DL,LP	
1760:0000,PH,VL,HL,DL,LP				1930:0000,PH,VL,HL,DL,LP	
1770:0000,PH,VL,HL,DL,LP				1940:0000,PH,VL,HL,DL,LP	
1780:0000,PH,VL,HL,DL,LP				1950:0000,PH,VL,HL,DL,LP	
1790:0000,PH,VL,HL,DL,LP				1960:0000,PH,VL,HL,DL,LP	
1800:0000,PH,VL,HL,DL,LP					

SPECIAL

Produce those colour
fades with this simple
to use program
By R. Hoben

If you have ever looked that little bit closer at a piece of software, you will notice many little touches that add a little bit more to the presentation. These touches can be anything from twisting sprites to colour effects. In this article I would like to discuss the use of colours to produce a fade effect, which when used in conjunction with your own program can create great title and instruction screens.

The first thing we must define is what exactly is a fade? A fade is basically where something, be it a sprite, gradually appears or disappears into the background. When an item appears, it is known as a fade-in and when it disappears, a fade-out.

In order to make the item fade, we must cycle it through a sequence of colours. To help you understand this, we will take a practical example. I want an instruction screen faded in from a black background and the instructions to end up in the colour yellow. We must now create the necessary colour sequence. The first colour should be the background colour - which in this case is black (000). We now want the text to gradually move from dark to light. The colours best suited for this are the three grey colours. So we add: Dark grey (005), Medium grey (00C) and light grey (00F).

Next we have an intermediate colour, which in this case is white (000). This intermediate colour is

preferably the opposite of the background. Lastly we put our final colour in which is yellow (007). If we had chosen the final colour to be light red then we could have put dark red in after white and then light red in order to provide a smoother colour transition. If you look at diagram 1 then you will see this whole example simplified.

Hopefully you should have followed all that. If you look at diagram 2, you will see the complete sequence for our example. So how do you use this sequence in your own programs?

If you type in **FADER LOADER**, which is in Basic, and run it, it will generate a program on disk called **FADER.MC**. Now in your Basic or M/C program all you have

FADER THEORY, DIAGRAM 1



[illegible]

COLOUR:	BLACK	BROWN	GREY	GREEN	WHITE	YELLOW
DECIMAL	0	11	12	13	14	15
HEX	000	808	80C	80F	FFF	FF0

to do is load **PAINTER.MC** and then, probe the values for your sequence using location **SC0355** (490055) onwards, accumulating the sequence with **STP** (255). Now all you have to do is print the text you want to be faded onto the screen in the **SAME** column as the background. E.g. if you are fading the text in from a black background, then print the text onto the screen in black. It is then only a matter of typing **55549152** and here you are!

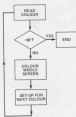
If you want to use this in action, then type in `FADER.DEMO` and run it. Note, you must have `FADER.MC` on the tape or disk first. I have present the demo to do the fade in as in the example I have just given. Now the

you know how to fade-in, you can fade-out simply by reversing the sequence.

This fade technique can be applied to sprites and high-resolution screens. Hopefully you should be able to develop your own programs to do this. An example of doing a fade with sprites is given in the program SPRITE_FADE.

On a final note, you should have no problems typing in the programs, as they are all in Basic. Also for those of you interested, I have given a rough flow diagram for FADIR.MC which is shown in diagram 3. So there you have everything you need and, hopefully you should be able to put this excellent technique to good use.

Abstract



TAPE USERS WILL HAVE TO
ALTER ALL THE 8s to 1s.



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[illegible][illegible]

```

10  G=FORNORM(0, FORNORM, 0
11  DO 10 I=1,N

```

```

00 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00 00
01 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
02 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
03 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
04 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
05 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
06 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
07 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
08 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
09 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0A 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0B 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0C 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0D 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0E 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00
0F 00 0000 00 00 00 00 00 00 00 00 00 00 00 00 00

```

RESEARCH, POLICE, PAPER

[illegible]

01	80	POKESKORP, 10, POKESKORP, 10
05	80	POKESKORP, 110, POKESKORP, 110
09	80	POKESKORP, 120, POKESKORP, 120
04	100	POKESKORP, 130, POKESKORP, 130
08	140	POKESKORP, 140, POKESKORP, 140
12	180	POKESKORP, 150, POKESKORP, 150
16	220	POKESKORP, 160, POKESKORP, 160
20	260	POKESKORP, 170, POKESKORP, 170
24	300	POKESKORP, 180, POKESKORP, 180
28	340	POKESKORP, 190, POKESKORP, 190
32	380	POKESKORP, 200, POKESKORP, 200
36	420	POKESKORP, 210, POKESKORP, 210
40	460	POKESKORP, 220, POKESKORP, 220
44	500	POKESKORP, 230, POKESKORP, 230
48	540	POKESKORP, 240, POKESKORP, 240
52	580	POKESKORP, 250, POKESKORP, 250
56	620	POKESKORP, 260, POKESKORP, 260
60	660	POKESKORP, 270, POKESKORP, 270
64	700	POKESKORP, 280, POKESKORP, 280
68	740	POKESKORP, 290, POKESKORP, 290
72	780	POKESKORP, 300, POKESKORP, 300
76	820	POKESKORP, 310, POKESKORP, 310
80	860	POKESKORP, 320, POKESKORP, 320
84	900	POKESKORP, 330, POKESKORP, 330
88	940	POKESKORP, 340, POKESKORP, 340
92	980	POKESKORP, 350, POKESKORP, 350
96	1020	POKESKORP, 360, POKESKORP, 360
100	1060	POKESKORP, 370, POKESKORP, 370
104	1100	POKESKORP, 380, POKESKORP, 380
108	1140	POKESKORP, 390, POKESKORP, 390
112	1180	POKESKORP, 400, POKESKORP, 400
116	1220	POKESKORP, 410, POKESKORP, 410
120	1260	POKESKORP, 420, POKESKORP, 420
124	1300	POKESKORP, 430, POKESKORP, 430
128	1340	POKESKORP, 440, POKESKORP, 440
132	1380	POKESKORP, 450, POKESKORP, 450
136	1420	POKESKORP, 460, POKESKORP, 460
140	1460	POKESKORP, 470, POKESKORP, 470
144	1500	POKESKORP, 480, POKESKORP, 480
148	1540	POKESKORP, 490, POKESKORP, 490
152	1580	POKESKORP, 500, POKESKORP, 500
156	1620	POKESKORP, 510, POKESKORP, 510
160	1660	POKESKORP, 520, POKESKORP, 520
164	1700	POKESKORP, 530, POKESKORP, 530
168	1740	POKESKORP, 540, POKESKORP, 540
172	1780	POKESKORP, 550, POKESKORP, 550
176	1820	POKESKORP, 560, POKESKORP, 560
180	1860	POKESKORP, 570, POKESKORP, 570
184	1900	POKESKORP, 580, POKESKORP, 580
188	1940	POKESKORP, 590, POKESKORP, 590
192	1980	POKESKORP, 600, POKESKORP, 600
196	2020	POKESKORP, 610, POKESKORP, 610
200	2060	POKESKORP, 620, POKESKORP, 620
204	2100	POKESKORP, 630, POKESKORP, 630
208	2140	POKESKORP, 640, POKESKORP, 640
212	2180	POKESKORP, 650, POKESKORP, 650
216	2220	POKESKORP, 660, POKESKORP, 660
220	2260	POKESKORP, 670, POKESKORP, 670
224	2300	POKESKORP, 680, POKESKORP, 680
228	2340	POKESKORP, 690, POKESKORP, 690
232	2380	POKESKORP, 700, POKESKORP, 700
236	2420	POKESKORP, 710, POKESKORP, 710
240	2460	POKESKORP, 720, POKESKORP, 720
244	2500	POKESKORP, 730, POKESKORP, 730
248	2540	POKESKORP, 740, POKESKORP, 740
252	2580	POKESKORP, 750, POKESKORP, 750
256	2620	POKESKORP, 760, POKESKORP, 760
260	2660	POKESKORP, 770, POKESKORP, 770
264	2700	POKESKORP, 780, POKESKORP, 780
268	2740	POKESKORP, 790, POKESKORP, 790
272	2780	POKESKORP, 800, POKESKORP, 800
276	2820	POKESKORP, 810, POKESKORP, 810
280	2860	POKESKORP, 820, POKESKORP, 820
284	2900	POKESKORP, 830, POKESKORP, 830
288	2940	POKESKORP, 840, POKESKORP, 840
292	2980	POKESKORP, 850, POKESKORP, 850
296	3020	POKESKORP, 860, POKESKORP, 860
300	3060	POKESKORP, 870, POKESKORP, 870
304	3100	POKESKORP, 880, POKESKORP, 880
308	3140	POKESKORP, 890, POKESKORP, 890
312	3180	POKESKORP, 900, POKESKORP, 900
316	3220	POKESKORP, 910, POKESKORP, 910
320	3260	POKESKORP, 920, POKESKORP, 920
324	3300	POKESKORP, 930, POKESKORP, 930
328	3340	POKESKORP, 940, POKES

Strung Along

Understand the use of strings with this clear, concise explanation

By E. Dumbill

It is common knowledge that CBM64 Basic is far from easy to use at the best of times. This problem may have put many people off trying to program for themselves. One of the main inadequacies in the language is the functions designed to handle string variables, that is, LEFT\$, RIGHT\$ and MID\$. I will describe the use of these functions in detail later. Basically, they allow the programmer to extract 'chunks' from string variables to manipulate within the program. Very well, you say, so what is wrong with that? Well, the problem is that while you can use LEFT\$ etc. to extract bits from strings, see figure 1, you are not allowed to surgically change parts of a string, see figure 2.

Figure 1

```
AS="ABC"
PRINT LEFT$(AS,2)
the result would be: AB
```

Figure 2

```
AB="ABC"
```

```
Now, supposing you wanted to change the 'AB' to 'DE' you might type:
LEFT$(AS,2)="DE"
the result would be: Syntax error
```

As you can see, the computer will let you see what is there, but you are not permitted to change it. Many other forms of Basic do allow this function. Wouldn't it be nice if, just like using DEF FN in arithmetic, we could define functions to allow us to alter strings? But, you have guessed it, C64 Basic will not allow it. I thought that this was inconvenient to say the least, and so I produced a series of subroutines which would allow me to alter my strings.

I will start at the beginning and describe to you how each function works, and how the surgical version of it works.

LEFT\$

This function lets you take the leftmost characters from a string. The syntax is: LEFT\$(string, *elements*), where *elements* = the amount of characters you wish to extract. This number can obviously not be greater than the number of characters in the string.

RIGHTS

This function is very similar to LEFTS, in that it takes the rightmost characters from the string. The syntax is identical to that of LEFTS.

MIDS

This function allows you to take characters from the MIDDLE of a string, starting at the character that you specify. It is a very useful function and has many applications. For example, searching through a string to find a key character (perhaps '?'). The syntax is `MIDS (string$, start, characters)` where `start` is the start character and `characters` is the amount of characters you wish to extract. Figure 3 shows a very simple example.

Figure 3

```
AS="ABCDE"
PRINT MID$(AS,3)
the result would be: BCD
```

Now you know how to use the main functions, we can use these functions to help us define routines to alter strings at our leisure. Let's start with LEFTS. If we are altering the LEFTS part of a string, we are obviously leaving alone the RIGHTS part of the string. With this in mind, we can say that:

```
altered STRING=NEW BITS+RIGHTS (OLD STRING,N)
```

But, we do not know how many characters to change in the LEFTS, and consequently, how many RIGHTS characters (represented by `N`) to put on the end of the altered string to make it complete. For this, we need to use another function: LEN. This returns the number of characters in a string, referring to Figure 4 the instruction:

```
PRINT LEN (AS)
would result in 5
```

If we can call the number of characters we want to leave (what is LEN (STANDARD) minus `N`). We can put this into our program using LEFTS surgery:

```
altered STRING=NEW BITS+RIGHTS (OLD STRING,N)
```

But, it is a pain to have to state both the NEW BITS, so we obviously need to use our friend LEN, and define `N` as LEN (NEW BITS). So, our revised program looks like this:

```
ALTERED STRING=NEW BITS+RIGHTS (OLD STRING, (LEN (OLD STRING)-LEN (NEW BITS))
```

Complicated isn't it? No, not really! Here is a breakdown of the ugly looking RIGHTS function I used. What it does is to take the original string, and to chop off the LEFTS that is to be replaced by NEW BITS. The length of the bit remaining intact (the RIGHTS) is given by subtracting the length of the changed bit (NEW BITS) from the length of the original string.

When?

Now that we have struggled through that, we can actually do something with it, and write a routine to use in our programs.

Here is a simple example of the routine and how to call it:


```

100 L3=RIGHT$(L3,LEN(N3)-LEN(N1))
110 RETURN
120 L3="CAT SAT ON THE MAT"
130 N3="DAN". GOTO 110

```

If you now run with GOTO 100, then type PRINT L3, hey presto!, the string L3 will have changed to DAN SAT ON THE MAT. Just a few notes about the routine: You will always have to use L3 and N3 for the strings to be specified, as there is no way of creating a new function. What we are doing is making a program that uses global variables, and there is no way of making values of variables stay GLOBAL inside the routine (LOCAL) as there is in other basics. That is the major limitation of the routine. So if, for example, you are using the variable W1, and wished to alter it, you would need to make L3=W1 before calling the routine, and W1=L3 after calling the routine. For this reason, you may find it more convenient to include line 100 as part of the main program, instead of using it as part of the sub-routine. This too has its disadvantages, such as getting a sore finger from repeatedly typing brackets!

The sub-routine for a surgical RIGHTS is obviously going to be much the same, but we must exchange the RIGHTS in the routine for a LEFTS, as it will be the LEFTS that we will now want to have intact!

Here is the routine for a surgical RIGHTS

```

100 L3=LEFT$(L3,LEN(L3)-LEN(N3)+N3
110 RETURN

```

The use of this routine is much the same as the one above. How simple you cry! Doesn't it look easy? Well, yes it does, but then we discover a startling block in the form of MIDS. However, with a bit of logical thought we can overcome it.

Just as a string is composed of LEFTS and RIGHTS, it is also composed of LEFTS, MIDS and RIGHTS. Therefore, we now get:

ALTERED STRING=LEFT\$(OLD\$,N)+NEW BITS+RIGHT\$(OLD\$,N)

As with MIDS, we can't get away with 2 parameters, N3 and L3, but we need a third, S, which is the character at which the MIDS will start being inserted.

From that S, we can calculate all the information that we may need:

```

number of characters in LEFTS=S
number of characters in RIGHTS=LEN(L3)-S-LEN(N3)
so the program for MIDS surgery looks like this:

```

```

100
L3=LEFT$(L3,N3)+RIGHT$(L3,LEN(L3)-S-LEN(N3))
110 RETURN

```

Use it as for the routine using LEFTS and RIGHTS, but with the extra inclusion of S, the start character for the insertion of N3.

I hope that you have enjoyed and understood this approach to constructing program routines to the end of making your own functions. Also, I hope that you can appreciate the power that a little thought adds to the humble C64 Basic.

Keep stringing!

EXTENDING BASIC PART 8

**Add an auto line
numbering facility to
your collection of
extended Basic routines**

**By Burghard-Henry
Lehmann**

When you enter a Basic textfile, the one thing which is fairly regular is the line numbers. Since computers are very good at doing regular, monotonous tasks, it makes sense to let the computer do the line numbering. All you have to do then, is worry about designing your program!

Automatic line numbering is pretty easy. All we have to do is intercept the flow of Basic in the ROM after a line has been entered into the textfile, or before a new line is started off - whichever way you want to look at it. For this let me elaborate on how Commodore Basic deals with a newly entered line.

Basic Warm Start

The whole process starts at \$A483, the so-called Basic Warm Start routine. This is the central point to which Basic loops back each time a line has been entered into the textfile or a direct command has been executed.

This point is so important, that it has been copied by those clever Commodore ROM designers. That is, instead of jumping straight to \$A483, the computer fetches the address it has to jump to from the vector at \$0002. Under normal circumstances this location which lies in RAM and can be changed by the programmer, contains \$A483 - the Basic Warm Start routine.

This will be the point where we will intercept Basic to introduce our auto line numbering routine. More about this in a minute.

At the beginning of the Warm Start routine, the computer goes into a loop which waits for the user to enter a character on the keyboard. This character, which can be anything at this point, is stored in a location, called the input buffer (\$0000). Now the computer waits for the user to enter another character, this is stored in the following location in the input buffer, and so on until the user presses the return key (ASCII 13). This finishes this loop and terminates the character in the input buffer with a zero.

Now, the computer finds out, if the line entered has a line number in front of it or not. If it hasn't got a line number, the "statement", as it is called, is interpreted and executed immediately as a direct command.

If the line starts with a line number, the keywords in the line are converted into tokens and then the computer looks if a line with the same line number is already present in the textfile.

If a line with that line number exists already, the old line is deleted.

Finally, the new line is inserted into the textfile.

If the line has nothing after the line number, nothing is inserted into the textfile, thus if this line already exists it will be deleted.

are not changed back to normal, even when you see the run/stop restore key! So, we have to take care of this ourselves.

It makes sense to switch auto line numbering off, when the user enters nothing but the line number.

In this case our routine jumps to the apply called routine *NOTIFYING*, which resets the Warm Start vector back to normal (lines 2819-2848) and then jumps to the normal warm start in Room (line 2849).

By now you should understand how you go about patching in new commands to Commodore Basic and should be ready to write some of your own. Watch out for more from me in a future installment of *Extending Basic*.

```

2800 GET PAPER PARAMETER          2800     LDX #0
2801                               2801     JNE PAPER0
2802                               2802     LDX #1
2803     JNE PAPER1                 2803     LDX #2
2804     JNE PAPER2                 2804     LDX #3
2805     JNE PAPER3                 2805     LDX #4
2806     JNE PAPER4                 2806     LDX #5
2807     JNE PAPER5                 2807     LDX #6
2808     JNE PAPER6                 2808     LDX #7
2809     JNE PAPER7                 2809     LDX #8
2810     JNE PAPER8                 2810     LDX #9
2811     JNE PAPER9                 2811     LDX #A
2812     JNE PAPER0                 2812     LDX #B
2813     JNE PAPER1                 2813     LDX #C
2814     JNE PAPER2                 2814     LDX #D
2815     JNE PAPER3                 2815     LDX #E
2816     JNE PAPER4                 2816     LDX #F
2817     JNE PAPER5                 2817     LDX #0
2818     JNE PAPER6                 2818     LDX #1
2819     JNE PAPER7                 2819     LDX #2
2820     JNE PAPER8                 2820     LDX #3
2821     JNE PAPER9                 2821     LDX #4
2822     JNE PAPER0                 2822     LDX #5
2823     JNE PAPER1                 2823     LDX #6
2824     JNE PAPER2                 2824     LDX #7
2825     JNE PAPER3                 2825     LDX #8
2826     JNE PAPER4                 2826     LDX #9
2827     JNE PAPER5                 2827     LDX #A
2828     JNE PAPER6                 2828     LDX #B
2829     JNE PAPER7                 2829     LDX #C
2830     JNE PAPER8                 2830     LDX #D
2831     JNE PAPER9                 2831     LDX #E
2832     JNE PAPER0                 2832     LDX #F
2833     JNE PAPER1                 2833     LDX #0
2834     JNE PAPER2                 2834     LDX #1
2835     JNE PAPER3                 2835     LDX #2
2836     JNE PAPER4                 2836     LDX #3
2837     JNE PAPER5                 2837     LDX #4
2838     JNE PAPER6                 2838     LDX #5
2839     JNE PAPER7                 2839     LDX #6
2840     JNE PAPER8                 2840     LDX #7
2841     JNE PAPER9                 2841     LDX #8
2842     JNE PAPER0                 2842     LDX #9
2843     JNE PAPER1                 2843     LDX #A
2844     JNE PAPER2                 2844     LDX #B
2845     JNE PAPER3                 2845     LDX #C
2846     JNE PAPER4                 2846     LDX #D
2847     JNE PAPER5                 2847     LDX #E
2848     JNE PAPER6                 2848     LDX #F
2849     JNE PAPER7                 2849     LDX #0
2850     JNE PAPER8                 2850     LDX #1
2851     JNE PAPER9                 2851     LDX #2
2852     JNE PAPER0                 2852     LDX #3
2853     JNE PAPER1                 2853     LDX #4
2854     JNE PAPER2                 2854     LDX #5
2855     JNE PAPER3                 2855     LDX #6
2856     JNE PAPER4                 2856     LDX #7
2857     JNE PAPER5                 2857     LDX #8
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3285     JNE PAPER3                 3285     LDX #4
3286     JNE PAPER4                 3286     LDX #5
3287     JNE PAPER5                 3287     LDX #6
3288     JNE PAPER6                 3288     LDX #7
3289     JNE PAPER7                 3289     LDX #8
3290     JNE PAPER8                 3290     LDX #9
3291     JNE PAPER9                 3291     LDX #A
3292     JNE PAPER0                 3292     LDX #B
3293     JNE PAPER1                 3293     LDX #C
3294     JNE PAPER2                 3294     LDX #D
3295     JNE PAPER3                 3295     LDX #E
3296     JNE PAPER4                 3296     LDX #F
3297     JNE PAPER5                 3297     LDX #0
3298     JNE PAPER6                 3298     LDX #1
3299     JNE PAPER7                 3299     LDX #2
3300     JNE PAPER8                 3300     LDX #3
3301     JNE PAPER9                 3301     LDX #4
3302     JNE PAPER0                 3302     LDX #5
3303     JNE PAPER1                 3303     LDX #6
3304     JNE PAPER2                 3304     LDX #7
3305     JNE PAPER3                 3305     LDX #8
3306     JNE PAPER4                 3306     LDX #9
3307     JNE PAPER5                 3307     LDX #A
3308     JNE PAPER6                 3308     LDX #B
3309     JNE PAPER7                 3309     LDX #C
3310     JNE PAPER8                 3310     LDX #D
3311     JNE PAPER9                 3311     LDX #E
3312     JNE PAPER0                 3312     LDX #F
3313     JNE PAPER1                 3313     LDX #0
3314     JNE PAPER2                 3314     LDX #1
3315     JNE PAPER3                 3315     LDX #2
3316     JNE PAPER4                 3316     LDX #3
3317     JNE PAPER5                 3317     LDX #4
3318     JNE PAPER6                 3318     LDX #5
3319     JNE PAPER7                 3319     LDX #6
3320     JNE PAPER8                 3320     LDX #7
3321     JNE PAPER9                 3321     LDX #8
3322     JNE PAPER0                 3322     LDX #9
3323     JNE PAPER1                 3323     LDX #A
3324     JNE PAPER2                 3324     LDX #B
3325     JNE PAPER3                 3325     LDX #C
3326     JNE PAPER4                 3326     LDX #D
3327     JNE PAPER5                 3327     LDX #E
3328     JNE PAPER6                 3328     LDX #F
3329     JNE PAPER7                 3329     LDX #0
3330     JNE PAPER8                 3330     LDX #1
3331     JNE PAPER9                 3331     LDX #2
3332     JNE PAPER0                 3332     LDX #3
3333     JNE PAPER1                 3333     LDX #4
3334     JNE PAPER2                 3334     LDX #5
3335     JNE PAPER3                 3335     LDX #6
3336     JNE PAPER4                 3336     LDX #7
3337     JNE PAPER5                 3337     LDX #8
3338     JNE PAPER6                 3338     LDX #9
3339     JNE PAPER7                 3339     LDX #A
3340     JNE PAPER8                 3340     LDX #B
3341     JNE PAPER9                 3341     LDX #C
3342     JNE PAPER0                 3342     LDX #D
3343     JNE PAPER1                 3343     LDX #E
3344     JNE PAPER2                 3344     LDX #F
3345     JNE PAPER3                 3345     LDX #0
3346     JNE PAPER4                 3346     LDX #1
3347
```


PROGLOK

Stop prying eyes and
itchy fingers with this
handy program

By Zak Beck

This program enables you, having just written your latest masterpiece, to 'lock' the computer so that, say, the kids cannot spoil all your hard toil. Before leaving your computer, it simply requires that you press 'H' and enter any 8-digit password. Before the computer will return back to the language (eg BASIC), the correct code must be entered. This idea has been used before on expensive utility cartridges - well now you have it at little if no cost!

How it all works

The program is written in machine code. Obviously, if it were written in Basic, it would not be compatible with your masterpiece. It resides before Basic, from \$1800 to \$24C7, in the application or cartridge program area. This means that Basic does not have to be moved about, but the program MAY clash with some cartridges which use this area as a workspace.

When you first use the program, it sets up function key 'H' to call itself, and then returns back to Basic. When you wish to 'lock' the computer, press 'H'. The program first deactivates the restore key, prints up its title, and some prompts. It does this using a kernel call called 'PRINTM' - print message. This works as follows:

```
PR print
key "Message goes here";B
```

(rest of program follows.)

Having called 'PRINTM', the com-

puter will print out everything that follows until it comes across a 'B' byte. Then it jumps back to your sub-routine. This useful message-printer resides at \$24D0, \$27FD.

Proglok, having printed its title and prompts will then ask for any 8-character code. This is implemented by subroutine 'getcod', which inputs 8 characters, storing them in buffer 'buff'. Then the program stores the contents into the password storage space, 'pass'.

Next, prompts are printed (label 'test'), to tell the user that the computer has been locked, and that to use it he has to enter a 8-character password. Using 'getcod', an attempt is entered into the buffer 'buff', and the contents of 'buff' are compared with the password 'pass'. If any discrepancies are found, the computer jumps back to 'test'. Otherwise, the restore key is reactivated, and the computer returns to the language (eg BASIC).

Using the Program

Type in the program (see getting it all in). Next, type the following:

```
SYS4864 and press return
```

This will initialise function key 1 to read 'SYS4864' + chr\$(13) as the command 'KEY' will show.

Pressing 'H' in direct mode will call up the program, executing a call to address 4891. You can now enter your key-coded, using any of the keys on the keyboard, including Line Feed and those on the keypad at the right of the 128. I feel six characters provide a fairly secure code, who wants their computer to be Fort Knox?

The password having been

entered, the computer is immune to the restore key, and can only be accessed by typing in your code. When you come to want to use the machine again, press any key and you will come a screen asking you to enter your code. Entering the right code will take you into BASIC, entering the wrong one will take you back to the press any key screen again.

Should you forget the code, there is a useful little trick to enable you to recover your program. Follow the below instructions carefully:-

1. Hold down the RUN/STOP key.
2. Press in the reset button while holding RUN/STOP.
3. When the computer powers up, you will be in the monitor. Release RUN/STOP now!
4. Type: X and press return.
5. You will be back in BASIC. Typing LIST and pressing return should give you your program back.

Getting it in

The Basic loader is easy to use. Just type it all in very carefully, and save it to tape or disk. Then run it. If you've made a mistake, TYPING ERROR will appear. If everything is alright, you can save the code using the following BASIC line:

```
SAVE "Filename",BIS,P0000 TO P0013
```

When you want to use the program some time, use:

```
LOAD "Filename"
```

```
SYS 4864
```

And then follow the instructions under 'Using the Program...'

And that's it...



PROGRAM LIST

```

1 REM *****
2 REM * PRGLOADER LOADER *
3 REM * EPSK MODE: ON *
4 REM *****
5 IF PRGNAME=000 THEN 0
6 PRINT "SEQUENCE - THIS PROGRAM
  ONLY WORKS FOR INT"
7 PRINT"END"
8 END
9 GO-TO PORT=4000 TO 5013;REM IN
  C=0;A=0;B=0
10 IF C=0;GOTO 000 THEN PRINT "FIVE
  SECONDS" :END
11 PRINT"REDUCE INSTALL ON"
12 PRINT"END"
13 DATA 68,16,133,888,588,28,133
14 DATA 68,168,888,168,1,178,88
15 DATA 68,78,168,888,88,88,88

```

```

16 DATA 68,88,87,78,13,8,168
17 DATA 141,88,3,38,168,888
18 DATA 147,888,888,888,888,888
19 DATA 888,888,888,888,888,888
20 DATA 888,888,888,888,888,888
21 DATA 888,888,888,888,888,888
22 DATA 888,888,888,888,888,888
23 DATA 888,888,888,888,888,888
24 DATA 888,888,888,888,888,888
25 DATA 888,888,888,888,888,888
26 DATA 888,888,888,888,888,888
27 DATA 888,888,888,888,888,888
28 DATA 888,888,888,888,888,888
29 DATA 888,888,888,888,888,888
30 DATA 888,888,888,888,888,888
31 DATA 888,888,888,888,888,888
32 DATA 888,888,888,888,888,888
33 DATA 888,888,888,888,888,888
34 DATA 888,888,888,888,888,888
35 DATA 888,888,888,888,888,888
36 DATA 888,888,888,888,888,888
37 DATA 888,888,888,888,888,888
38 DATA 888,888,888,888,888,888
39 DATA 888,888,888,888,888,888
40 DATA 888,888,888,888,888,888
41 DATA 888,888,888,888,888,888
42 DATA 888,888,888,888,888,888
43 DATA 888,888,888,888,888,888
44 DATA 888,888,888,888,888,888
45 DATA 888,888,888,888,888,888
46 DATA 888,888,888,888,888,888
47 DATA 888,888,888,888,888,888
48 DATA 888,888,888,888,888,888
49 DATA 888,888,888,888,888,888
50 DATA 888,888,888,888,888,888
51 DATA 888,888,888,888,888,888
52 DATA 888,888,888,888,888,888
53 DATA 888,888,888,888,888,888
54 DATA 888,888,888,888,888,888
55 DATA 888,888,888,888,888,888
56 DATA 888,888,888,888,888,888
57 DATA 888,888,888,888,888,888
58 DATA 888,888,888,888,888,888
59 DATA 888,888,888,888,888,888
60 DATA 888,888,888,888,888,888
61 DATA 888,888,888,888,888,888
62 DATA 888,888,888,888,888,888
63 DATA 888,888,888,888,888,888
64 DATA 888,888,888,888,888,888
65 DATA 888,888,888,888,888,888
66 DATA 888,888,888,888,888,888
67 DATA 888,888,888,888,888,888
68 DATA 888,888,888,888,888,888
69 DATA 888,888,888,888,888,888
70 DATA 888,888,888,888,888,888
71 DATA 888,888,888,888,888,888
72 DATA 888,888,888,888,888,888
73 DATA 888,888,888,888,888,888
74 DATA 888,888,888,888,888,888
75 DATA 888,888,888,888,888,888
76 DATA 888,888,888,888,888,888
77 DATA 888,888,888,888,888,888
78 DATA 888,888,888,888,888,888
79 DATA 888,888,888,888,888,888
80 DATA 888,888,888,888,888,888
81 DATA 888,888,888,888,888,888
82 DATA 888,888,888,888,888,888
83 DATA 888,888,888,888,888,888
84 DATA 888,888,888,888,888,888
85 DATA 888,888,888,888,888,888
86 DATA 888,888,888,888,888,888
87 DATA 888,888,888,888,888,888
88 DATA 888,888,888,888,888,888
89 DATA 888,888,888,888,888,888
90 DATA 888,888,888,888,888,888
91 DATA 888,888,888,888,888,888
92 DATA 888,888,888,888,888,888
93 DATA 888,888,888,888,888,888
94 DATA 888,888,888,888,888,888
95 DATA 888,888,888,888,888,888
96 DATA 888,888,888,888,888,888
97 DATA 888,888,888,888,888,888
98 DATA 888,888,888,888,888,888
99 DATA 888,888,888,888,888,888
100 DATA 888,888,888,888,888,888

```

C64 PROGRAMMING

THE USER PORT

When Commodore created the user port, they did not intend it to be used purely for RS232 communications, but instead to form a link between the computer and the outside world.

Despite the fact that there are twenty four lines available from the user port, only ten are actually required to connect the C64 to the outside world: PBO-PB7, 5, GND.

The 5v and Ground (GND) lines can usually be used to power anything which is connected to the C64, but you must be careful not to draw more than 100mA amps because this will damage the computer.

The theory

You should already know that there are eight lines in the user port (called PBO-PB7) which are available for the use of the individual. However, to actually use these lines they must be set to either input or output (they are set to input on power up). Luckily, the Commodore operating systems makes this an extremely simple process. At location 56579 there is a bit for each line. To set a line to input make the bit zero, to set a line to output the bit must be one, (or if you set bit 3 to one then line PB0 will be set to output). The following example should make this easier to understand.

```

Bit No: 7 6 5 4 3 2 1 0
Value: 0 1 0 0 1 1 0 0

```

Explore the possibilities
of this versatile user
port

By R. Smedley

You can see that lines 6, 3 and 2 are going to be set to output, and lines 7, 1, 4, 1 and 0 set to input. To actually achieve this configuration, the binary number, next to the value, must be translated into decimal so that it can be entered into the computer, using the 'poke' statement. The necessary calculation is as follows:

2 to the power of 6 = 2 to the power of 3 = 2 to the power of 2.

In other words $64+8+4$ which equals 76. Therefore, to achieve the configuration in the example we would have to **POKE 56579,76**.

Output

Now that the lines have been set, assuming some have been set to output, it becomes necessary to have a way of controlling the state of the lines (either low or high), which again is an extremely simple process. A bit has been allocated to each line at location 56579. To make a line go high you set it to zero (i.e. if you set bit 6 to 1 then line P06 will be taken to be high). You must remember not to try and output through a line set to input because this will just confuse the C64.

The following example should make this clear:

```
Bit no: 7 6 5 4 3 2 1 0
Value: 0 1 0 0 0 1 0 0
```

As you can see, lines 6 and 2 are required to go high, leaving the other lines low. Again, this binary figure must be translated into decimal. Using the same process as above we discover that the figure required is 68. Therefore the following statement must be entered:

PROGRAM: LISTING 1

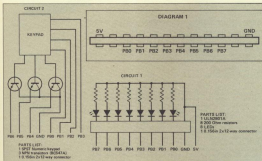
```
10 REM*****
20 REM LISTING 1- BY B.J.B.M.
30 CLY 1000
40 REM*****
50 A=0: A=1: FORW=0: A=1+400
  :LOO NEXT
61 50 A=0: A=1: D=1
70 FORW=FORW+1
80 POKE 56579-D, FORW
  :GOTO 50
91 60 FORW=0: NEXT D
92 FORW=0: FORW=0: A=1
93 FORW=0: NEXT D
94 100 PRINT: GOTO 100
95 100 PRINT: GOTO 100
96 100 END: GOTO 0: GOTO 100
```

PROGRAM: LISTING 2

```
10 REM*****
20 REM LISTING 2- BY B.J.B.M.
30 CLY 1000
40 REM*****
50 B=0: B=0: B=0: B=0: B=0: B=0: B=0: B=0
60 C=0: C=0: C=0: C=0: C=0: C=0: C=0: C=0
70 D=0: D=0: D=0: D=0: D=0: D=0: D=0: D=0
80 E=0: E=0: E=0: E=0: E=0: E=0: E=0: E=0
90 F=0: F=0: F=0: F=0: F=0: F=0: F=0: F=0
100 PRINT: GOTO 100
```

PROGRAM: LISTING 3

```
10 REM*****
20 REM LISTING 3- BY B.J.B.M.
30 CLY 1000
```



[illegible]

PAGE 54572 000

To enable you to see for yourselves what effect the contents of location 28377 has on the state of the lines, you might like to construct Circuit 1 (refer to Figure 1 for the pin configuration of the user port). The device consists of a ULN2801A octal darlington driver which amplifies the signal from the user port, to light the LEDs on the lines which have been taken high (shown using the device you must enter **POB1 28377,155** to set all the lines to output). In order to see the speed and accuracy at which the computer can control the lines, you might like to enter Listing 1. (As the program gains speed whilst it is running, you must remember that there is only one LED lit at a time, the reason for you seeing more than 1 is because the effect of the image lasts on your retina for a microsecond or 1/10th of a second.)

100

Assuming that some of the lines have been lost to input, it becomes necessary to have a method for reading the music of the lines. As you already know, there is a box allocated to each line at location 58577, so to read the lines all you have to do is read the PEER, this location, remembering that if some of the lines have been lost to corrupt their part of this figure will correspond to corrupt. Reading of this and having to know which lines have been found line by an external device, you will have to convert the original numbers from decimal to binary. The easiest way of doing this is shown below:

Net Number:	7	6	5	4	3	2	1	0
Flow Values:	130	64	32	16	8	4	2	1

To use this table to convert decimal to binary, you take your decimal number and look at the chart. Take the largest number (from the bottom row) which is smaller than your number. You then simply repeat this process until your number is reduced to zero, when you get a 0 by the bit number which does not have a 1 by them. You now have your binary figure. Where you see a 1 the line is high, and a 0 shows a line which is low.

For any second example, `csview`, I thought it might be nice to come up with a program that would be useful to other programmers. `csview` 2 gives the necessary details to connect a numeric keypad to the C64. In order to see what effect pressing keys on the keypad has on the state of the lines, you should enter Listing 2. To actually use the keypad, enter and run Listing 3 (An IBM driver program which reads the keypad and then displays the relevant characters on the screen, because of which it will only work when the computer is in direct mode).

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RIK OF THE JOURNOS



His Wanderer played for The World-famous Wanderers. They were competing in the Grandiose Charity Shield and their fans had turned out to be huge...



Then it was the Journo match!



The final semi-final was the best of the World in The Software Publishers...

BUT THE BALL'S DOWN THAT END!



...The best of the World ended as 1-0 winners!

His didn't score, but the Journo obliged.



...twice!

O'MON FOR SCORE A GOAL!

I LOVE MY HAIR IS LOOKING GREAT!



The team that they beat, The Distributors, who lost the 3rd/4th place play-off



And so it came to the last. The journey to The Rest of the World.

MURDER

7

GO! GO! WOMEN!

But 'Mickey' Kerranagh refused to lie down.

9

Very soon, The journey was 2-0 down!

WHAT A BOTTOM!

8

With 5 minutes to go, he scored straight from the corner spot!

And then from a free kick!

10

11

And so the match was decided on penalties...

...The journey last, but were not disappointed!

I WONDER WHAT TIME THE PUB OPENS!

12

THE END

Photography: Frank Marovetz
Script: Rick Anonymous



You may ask what YC is doing to celebrate the new football season? Well we, coupled with those wobbly chappies (and chappresses) in Empire, are giving away a football and a Tottenham shirt. But hold onto your aluminium studs, these are no ordinary Spurs goodies. They're Spurs goodies signed by the Man bar kid himself, Paul Gascoigne.

To get your gobby mitts on the prizes (as modelled here by the delectable Maria Wade) you must answer the following three questions. To make it harder for you we insist that you do it whilst joggng on the spot.

1. From what team did Tottenham sign Paul Gascoigne?

- a) Newcastle United.
- b) Middlesbrough.
- c) Washington Redskins.

2. When was the last time that Tottenham won the FA Cup?

- a) When dinosaurs did control the Earth.
- b) 1981-82.
- c) 1980-81.

3. How tall is our Gaffer?

- a) 2' 10"
- b) As tall as Blackpool tower.
- c) 3' 2"

Put the answers on the back of a postcard (or scaled envelope) and send them to:

Gazza Compo, YC, Argus House, Boundary Way, Hemel Hempstead, HPE 7BT.

The first correct card pulled out of the woolly hat on 15th November 1989 will grab the shin-studs.

The Ever Important Big Wobbly Rules

Entries will not be accepted from employees of Argus Specialist Publications, or Empire. This restriction also applies to employees families, agents of the companies, and pieces of fruit.

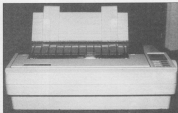
The entry restrictions form part of the rules and the Editor's decision is final (you can be guaranteed that it will be a good one though). No correspondence will be entered into. In the event of a flood, we reserve the right to use a hairdryer.

PS. No entries will be accepted if scribbled on the back of a cabinet minister.

GET SHIRTY!

Could Duncan Evans be confucius? Not likely, but he has certain similarities, neither of them played full-back for Liverpool. He also runs his beadies over the new Swift 24-pin printer.

SWIFT AS A NEWT



Above: A rather decorative little number, don't you think?

Confucius he say, "Computer without printer is like Steve Overt - it's all in the memory." Well I lie, he didn't really, I made that up. He would probably have had a printer though, I mean how else are you going to output your mind boggling philosophical doctrines unless you can get a hard copy. Oh, it was easy enough in Confucius' day, you just ordered the nearest monk to start scrawling on a slate and before you could say, "The anatomy of Confucius", you were five generations down the line and your life's work was being published posthumously.

Unfortunately there aren't that many monks willing to spend their lives scrawling out my reviews for *Your Commodore*, and alas, very few more either, so in order to support myself and my football team of starving children I needed the hi-tech equivalent. Citizen Europe also realised that monks were in short supply, and that they wrote as quickly as a Commodore Printer, and thus released the 120-D, a relatively cheap 9-pin printer. This combined low cost with decent performance and became the biggest selling 9-pin printer in Europe.

Fair enough, but what has that to do with the price of cheese you may ask, and quite rightly too. Well, good old Citizen, flunked by the success of the 120-D has launched something of a racemover, the Swift 24, which it hopes will oust the 24-pin market in a similar manner to the 120-D and the 9-pin market.

The Swift 24 offers the reasonably low price of £389 ex VAT and the power of a 24-pin printer, plus the convenience of no dip switches. Interested? Then read on.

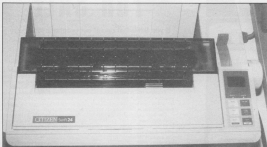
Amongst the many claims made for the Swift 24 by Citizen, is one of sturdiness. Okay, let's see I thought, and dropped it on the floor from a foot. Apart from the top flapping around like a fish in the sea outside Seaford, the Swift was unperturbed by its flying lesson. But then again, who has their printer situated only a foot off the floor? I tried two feet, and was rewarded with an undesirable piece of plastic whizzing past my ear as the shock wave set alarm bells ringing all over North London. The printer wasn't too happy with this treatment, and had to be calmed down and reassembled before it was up to printing out this article. I still don't know where that piece of plastic came from.

The Swift has a two-year warranty from Citizen, as long as they don't catch you dropping it on the floor, and the print head is guaranteed to give you 200 million dots before dying, while the rest of the moving internals will last approximately 4500 hours before ceasing to function. As long as you aren't rough with it, it should last five years with ease.

There's a tractor feed and an excellent single sheet paper feeder, and the printer is equipped with a Centronics parallel interface as standard with a serial RS232C as an optional extra.

Printing speed is another great claim in the advertising blurb, but at only 182 characters per second (at 12dpi) in draft mode its performance is only average against 9-pin printers in this price range. That's the fastest it gets, you should also take into consideration 168 CPS (at 18dpi) in draft, and more

(below: The Swift 24, faster than a speeding paycheque)



importantly 53 CPS at 18dpi and 64 CPS at 12dpi in NLQ mode. The NLQ fonts are presumably why you want this printer, otherwise I assure you, you are wasting your money. An 8K buffer helps the printing process, and a snappy little display tells you how much of the buffer is full of incoming data.

The default fonts are Times Roman (okay), Courier (very good), Helvetica (sans serif and excellent) and Prestige Elite (horrible). There is a cut away section of the printer where optional font cards can be plugged in to extend the range, and of course your software may be able to create additional fonts anyway. The dot density is 120 DPI in draft mode, and 360 DPI for NLQ and graphics modes.

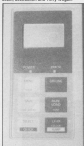
Instead of clip switches, the Swift has a two line, eight character LCD, and eight button keypad. This can be used to alter all sorts of printer functions including character set (from UK to Japan to Latin American), page layout (left and lines per inch), printer resolution (Epson LQ850, IBM Proprinter 324 and NDC P6+), font, colour or standard ribbon, pitch (proportional and up to 36CPI), and interface options.

The control panel also allows you access to four macros, which contain predefined settings. You can redefine any of these and save them into the Swift's electronically accessible programmable read only memory (EEPROM), so that when the printer is next switched on, your settings are automatically loaded as the default.

The Citizen Swift 24 is an excellent printer, offering the power of 24-pin printing, but with a low cost, considerable ease of use, a resilience to the sort of damage the average can inflict upon it, and it's backed up by a two year warranty. If Commodore was alive today, the Swift could have saved five generations of meek and unskilled lot of hard work.

Duncan Evans

(below: Don't press the button that says death, destruction and Terry Wogan.)



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It's three o'clock in the morning. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from Your Commodore. Your fingers reach for the keyboard and press the letters R, U and M. You press RETURN, sit back and nothing happens.

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The Your Commodore Software Service makes available all of the programs from each issue on both cassette and disk at a price of \$5.00 for disk and \$4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

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NEON ZONE

If it's Christmas, it must be coin-ops, coin-ops and more coin-ops. Well, that's what all the major publishers decided a few years back anyway and so the punters have responded with wopping the wads of green stuff on counters all around the country, if guess they must have been right.

You can count the home format hits over the years — *Quantik*, *Outrun*, *Operation Wolf* — just three of the titles that took the elusive number one spot over the festive season on consecutive years, with a whole trail of others not far behind, all riding on the back of phenomenal arcade success.

Christmas '86, *Quantik*, the first four-player game ever in the arcades, '87 gave us *Outrun* the best and most glamorous driving game at the time and in '88 came *Op Wolf* the not particularly ideologically sound electronic shooting gallery that virtually caused a world shortage of the pieces.

If you are an aficionado of coin-ops, you'll notice that there's a significant time lag between a machine hitting the arcades themselves and appearing on home formats. The reason for this is pretty obvious. Coin-op manufacturers program and manufacture the games to an almost finished state (bear in mind the scale of the operations here — Sega alone have a workforce of 400 engineers working on the next *Afterburner*), they then offer the license to program the game on home formats to the various software houses.

Decisions are made, deals — whereby obscenely large amounts of money change hands — are struck, and then the programming must begin. Yes, some poor son-of-a-bitch has now got to get down to the brass tacks of fitting some 4 Meg extravaganzas into 512, 64... or if he's done something particularly nasty in a past life, 48K.

How the hell do you start doing that, you might ask yourself? Well, in some cases it's quite simple. You don't. Many of the present generation of games, particularly the Sega titles, work by throwing tonnes of hardware at the thing, pre-chilling loads of sprites and just (just!) blasting them up on the screen very, very fast. And you can't do that on any affordable home machine available today. So what do you do?

Some contractors happen take the view that if you can't do it properly, you don't do it at all and turn such work down. Others, bear in mind that there is a fair bit of work being flung around for these jobs, not to mention possible prestige, set to work on cutting the original game down like a crazed plastic surgeon, so it can work on common home circuits, after a fashion.

In the days when all that was in an arcade machine was a 6809 processor, 32K or memory and a sound chip, true coin-op conversions were possible. Now, the coin-op hardware has accelerated away into the distance, way out of reach of even the high end home machines, like the Amiga. What you get now are coin-op facsimiles and anyone that thinks you get the same as the original deserves to get disappointed!

Maybe this is one of the reasons that coin-ops seem to be slightly less prevalent this year than previously. Attention is at it the same as ever though. Last year it was *Afterburner* and *N-Type* — this year it's *Altered Beast* and a very ambitious conversion of *Power Drift*.

Power Drift in particular is going to pose very, very significant problems, being a selection of blindingly fast sprite routines. Cut down the colours, take out the scenery, so it really going to be the same kind of experience as the original which was primarily designed to be a skin, throw you around, assault you with ear shattering decibels (oh! I think not, Brian).

How about *US Gold*, who must be pipped about failing to make the hat-trick with *Thunderblade* last time around? Only Capcom titles on release this year with a creditable version of *Strider* hitting the streets about now and *Goofs 'n' Ghosts* coming in on the run up to December. There's a near perfect version of this on the Sega Mega-Drive console, so this is certainly a possibility in the authenticity stakes, but the gameplay is a bit unimpressive and too similar to the original *Goofs 'n' Goblins* that did so well for Elite way back. But maybe the punters will be rushing back for more of the same.

Perhaps it's Ocean again who are in with the best stake at the top spot, as *Chase HQ* made a good enough impression in the arcades and, although challenging to write, is basically a driving game where you can hunk into the opposition. Got to be a contender along with *Op Wolf* follow up, *Operation*

ARCADES ■

Christmas is coming — and that means the start of the coin-op avalanche in the shops.

John Cook takes a look back at the arcade hits this year and wonders how the hell you fit a 4 Megabyte extravaganza into 512, let alone 64K!





Thunderbolt and Cabal.

But in the Dark Storm department, you have to consider *Dunmark* who'll be releasing on all formats the buggy, *Hard Drive'n'*, from Atari Games. Now this was the first coin-op to use filled polygon graphics (like *Cannier Command* — not counting the weird *3-Hole*!) — and it's a great game to boot.

Due to some dodgy programming statistics, the coin-op hasn't got a startlingly fast frame rate and the 16-bit version should come out about the same, with the 8-Bits suffering but still, probably acceptable, and in trendy 3-D too. That's my tip for the top for this Christy, for what it's worth. But what about next year...for now is the time that next years coin-op conversion has start making their way into the arcades.

Driving games have, again, been making the arcade operators feel warm inside as the pennies drop noisily into the coin slots. The award for most technically advanced has to go to *Winning Run* from a company called Namco. Like *Hard Drive'n'* this one is a filled poly game but with a difference. It's fast. Very, very fast with some heartbreakingly beautiful touches, such as fading the palette of background objects up as they proceed towards you. Just like in real life.

It's a race game *par excellence* as well with smart and quick opposition plus car handling you'd normally dream about. In two modes of difficulty — hard and bloody impossible — there's plenty of life in the thing, so get yourself along to an arcade and try it out now and good luck to the guy that has to put it on home format.

Sega is probably the single most successful arcade company. Its "I've got a hardware expanded sprite position and I'm going to use it" approach has spawned many hits, along with some sophisticated sit-in units. Its latest is also its best — *Super Monaco Grand Prix*.

SMGP is also a racing game — but with a different breed compared to something like *Winning Run*. If the latter were an elegant gymnast, *SMGP* would be Mike Tyson. The thing impresses by sheer power of volume and speed and is guaranteed to leave you breathless and wanting more! Can't see the software houses turning this one down.

Capcom has come up with a new hardware configuration called its CP System, based on a couple of super custom chips that were developed in-house.

This board can obviously do great things — *Strider* and the new *Wiz* and *Dynasty Wars* being three of them — but the feeling is that the best is yet to come.

In the best coin-op stakes, the sprites are becoming bigger and bigger — in game such as *Violence Fight* and *Data East's* fantasy combat bash, but nothing new beyond that.

After the success of *Op Wolf*, there have been many similarly inspired games, the white knuckled *Mechanized Attack* from SNK, *Cabal* and the latest, *Dynasty Duke*. The only surprising thing was that the official follow-up from Taito, the two player *Operation Thunderbolt* was such flop. Overall, however, '89 has established that the common or garden hardware used in the everyday PCB games has vastly outstripped the capability of the most popular home computers.

A simple game such as SNK's *Prohibition* has so much going on, in so many colours, even that would be difficult to undertake. The pace of technological change — the one that spawned home computers and video games almost simultaneously — is so fast that in coin-op terms, the machine you bought last year, let alone five years ago, is now obsolete in arcade terms.

Which begs the question — if that is the case, what will we all be playing in two Christmas's time? And on what machines? Enter stage left a Commodore games console, maybe? Well, whatever, keep that joystick handy, *Player One*, and give those alien hell! Until then, if you have been, to very much...Kirk out.



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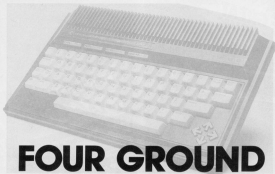
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Get in on the action



FOUR GROUND

Mark Everingham is back with the concluding part of his Introduction to Plus/4 Machine Language

7501 Machine Language Instruction Set

The instruction set of the 7501 processor is simply the collection of commands which the processor can understand, just like all the BASIC commands PRINT, LIST etc. What follows is a list of commands, each three characters long and requiring one operand. The action of the command is shown in symbolic form, with a brief explanation and example. All the examples can be entered into the TEDMON monitor using the method explained earlier. The valid addressing modes are shown along with the listing of any of the flags of the status register altered by the command. The meaning of each addressing mode is explained in the section entitled "The 7501 Addressing Modes". The conventions below are used in the symbolic representation of the operations. In order to conserve on space, only short examples have been included. Many such examples can be found in back issues of Four Ground or in the future *FourGround* articles.

- "h" - Hex digit of number
- "M" - A memory/immediate byte
- "N" - The Negative Flag
- "O" - The Overflow Flag
- "C" - The Carry Flag
- "X" - The X Register
- "D" - The Decimal Flag
- "Y" - the Y Register
- "I" - Interrupt Enable Flag
- "Z" - The Zero Flag

- [a] - [b] - Byte/Bit move from [a] to [b]
- [a] - [b] - Byte/Bit move from [b] to [a]
- [a] - Bit a (0-7) is a byte

ADC (Add With Carry)

Operation: $A \leftarrow M+C \leftarrow A$, Flags Altered: N,Z,C,V

Addressing Modes: ADC # Shb ADC Shb ADC Shb,X
ADC Shb,Y ADC ADC (Shb),Y
(Shb,X)

Function: The ADC instruction is used to add two numbers together, using the accumulator. The operand + the setting of the carry flag (1 or 0) is added to the accumulator and the result is left in the accumulator. Any carry necessary is shifted into the carry flag. If the result is > 127 then the N flag is set. If the result is zero, Z is set. If the result is > -127 or ≤ -128 , the V flag is set. Normally prior to use, you should clear the carry flag. The example below calculates the sum of 16 and 48.

Example: 8000 LDA # 100 ;Load A with value 100
CLC ;Clear Carry flag for addition
ADC # 48 ;Add value 48
BRK ;Return to TEDMON

AND (Perform Logical AND On Accumulator)

Operation: $A \text{ AND } M \leftarrow A$, Flags Altered: N,Z

Addressing Modes: AND # Shb AND Shb AND Shb,X AND Shb,X
AND AND AND AND
Shb,X Shb,Y (Shb,X) (Shb,Y)

Function: Those bits which are both set to 1 in the accumulator and in the operand are left as 1 in the result. All other bits are set to zero. If the result is >127 , N is set and if the result is zero, Z is set. The example below sets alternate bits in the byte 255 to zero.

Example: 6000 LDA #255 'Load A with value 255
AND #0AA 'And A with value 170
(alternate bits)
BRK 'Return to TEDMON

ASL (Arithmetic Shift Left)

Operation: $C \leftarrow (T_{10}) \leftarrow 0$ Flags Altered: N,Z,C

Addressing Modes: ASL, ASL, #bb ASL, #bb,X ASL, #bbh

Function: All the bits within either the accumulator or a memory location are shifted left. Bit 7 is shifted into the carry flag and Bit 0 is replaced with zero. The N and Z flags are set as for the AND instruction. Shifting a byte left has the effect in binary of multiplying it by two. The example below calculates 384 .

Example: 6000 LDA #518 'Load A with value 24
ASL 'Shift A left (*2)
ASL 'Shift A left (*2)
BRK 'Return to TEDMON

BCC (Branch if Carry Flag Clear)

Operation: Branch if C=0 Flags Altered: None

Addressing Modes: BCC, #bbhh

Function: The BCC instruction examines the status of the carry flag and if it is set to zero, jumps to the specified address. Note that the address must be within -128 or +127 of the command address. This is automatically checked by TEDMON. The below example adds two numbers and if a carry does not occur, stores the result on the screen.

Example: 6000 LDA \$A5 'Load A from address \$A5
CLC 'Clear carry flag for addition
ADC \$A6 'Add value in address \$A6
(Clock)
BCC \$0098 'If carry clear, jump to \$0098
BRK 'If set, return to TEDMON
STA \$0C00 'Store result on screen
BRK 'Return to TEDMON

BCS (Branch if Carry Flag Set)

Operation: Branch if C=1 Flags Altered: None

Addressing Modes: BCS, #bbhh

The BCS does the opposite of the BCC instruction. It tests the carry flag and if it is set, jumps to the specified address. Again, this address must be within -128 and +127 of the current address. See the example for BCC, substituting BCS for BCC. This stores the result in the screen memory if a carry **did** occur.

BEQ (Branch if Equal To Zero)

Operation: Branch if Z=1 Flags Altered: None

Addressing Modes: BEQ, #bbhh

Function: The BEQ instruction jumps to the specified address if the last result set the Z flag because it was equal to zero. The example below adds the value in \$D0 to the value in \$D1 and if the result is zero (they are both zero) then it stores an " " symbol on the screen.

Example: 6000 LDA \$D0 'Load A with value in \$D0
CLC 'Clear carry flag for addition
ADC \$D1 'Add value in \$D1
BEQ \$0008 'If result is zero, jump to \$0008
BRK 'Result is not zero - Return to TEDMON
STA \$0C00 'Store value 0 in screen
memory
BRK 'Return to TEDMON

BIT (Test Bits in Memory)

Operation: $(T) \text{ of } M \leftarrow N, (M) \text{ of } M \leftarrow Y$ Flags Altered: N,Z,V,A and M-Z

Addressing Modes: BIT, #bb BIT, #bbhh

Function: The BIT instruction tests the bits of a memory location against the value in the accumulator. Bit 7 of the memory value is transferred to N and Bit 6 to Z. If the result of ANDing A with the memory location is zero, the Z flag is set. Neither the values in the accumulator or in the memory location are changed. The example below looks at the first character on the screen and if it is reversed, replaces it with a space.

Example: 6000 BIT \$0C00 'Test bits of value on screen
BMI \$0006 'If character is reversed, jump to \$0006
BRK 'Not reversed - return to TEDMON
LDA # 320 'Load A with space character
STA \$0C00 'Store space character on screen
BRK 'Return to TEDMON

BMI (Branch On Minus)

Operation: Branch if N=1 Flags Altered: None

Addressing Modes: BMI, #bbhh

Function: The BMI instruction tests the setting of the N (minus) flag and if it is set, jumps to the specified address. The N flag is set by other instructions where the resultant byte is >127 (for 9 set). As for all other branches, the destination address must be within -128 or +127 of the current address. The example below counts from 128 to 254 in steps of two in the accumulator.

Example: 6000 LDA #500 'Load A with value 0
CLC 'Clear carry for addition
ADC # 80 'Add 2 to accumulator
BMI \$0002 'If result >127 jump to \$0002
(Loop)
BRK 'Result <128 - return to TEDMON

BNE (Branch if Not Equal To Zero)

Operation: Branch if Z=0 Registers Altered: None

Addressing Modes: BNE, #bbhh

Function: The BNE instruction does the opposite of the BEQ command, performing a jump if the last result was

■ FOUR GROUND

not true. See the example for BF_3 , replacing BF_3 with BPF .

Abstract

Operations: PC ← Stack, SR ← Stack, I ← 0	Flags	Notes
Adjusted		

Function: The **BREK** instruction, which needs no operand, forces a Break interrupt to occur. On the Plus/4, this causes control to be transferred to TEDMON. In fact, the instruction jumps to the address found in \$0016 like a JMP (\$0016) command. The PC and SR settings before the command may be pulled off the stack using PLA.

NYC: Branch II Operations Plan Closed

Classification	Branch	Year	Flags	Altitude	Name
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10
11	11	11	11	11	11
12	12	12	12	12	12
13	13	13	13	13	13
14	14	14	14	14	14
15	15	15	15	15	15
16	16	16	16	16	16
17	17	17	17	17	17
18	18	18	18	18	18
19	19	19	19	19	19
20	20	20	20	20	20
21	21	21	21	21	21
22	22	22	22	22	22
23	23	23	23	23	23
24	24	24	24	24	24
25	25	25	25	25	25
26	26	26	26	26	26
27	27	27	27	27	27
28	28	28	28	28	28
29	29	29	29	29	29
30	30	30	30	30	30
31	31	31	31	31	31
32	32	32	32	32	32
33	33	33	33	33	33
34	34	34	34	34	34
35	35	35	35	35	35
36	36	36	36	36	36
37	37	37	37	37	37
38	38	38	38	38	38
39	39	39	39	39	39
40	40	40	40	40	40
41	41	41	41	41	41
42	42	42	42	42	42
43	43	43	43	43	43
44	44	44	44	44	44
45	45	45	45	45	45
46	46	46	46	46	46
47	47	47	47	47	47
48	48	48	48	48	48
49	49	49	49	49	49
50	50	50	50	50	50
51	51	51	51	51	51
52	52	52	52	52	52
53	53	53	53	53	53
54	54	54	54	54	54
55	55	55	55	55	55
56	56	56	56	56	56
57	57	57	57	57	57
58	58	58	58	58	58
59	59	59	59	59	59
60	60	60	60	60	60
61	61	61	61	61	61
62	62	62	62	62	62
63	63	63	63	63	63
64	64	64	64	64	64
65	65	65	65	65	65
66	66	66	66	66	66
67	67	67	67	67	67
68	68	68	68	68	68
69	69	69	69	69	69
70	70	70	70	70	70
71	71	71	71	71	71
72	72	72	72	72	72
73	73	73	73	73	73
74	74	74	74	74	74
75	75				

Addressing Modes: MC 5000

Function: The JNC instruction tests the status of the V flag in the status register and if it is clear (no overflow has occurred), does a jump to the specified address. There is no equivalent JYS instruction. The example jumps until Bit 6 of the value in RAX is zero is as:

```

Example: 5000 BIT SIO      "Test bit 4 of value in SIO"
          BVC $6000        "Overflow (Bit 4) clear - loop
                           "to $6000"
          BRC "Overflow set - Return to TR0000"

```

CLE® Clear Case Files

Operations:	$O = E$	Mass Allowed:	E
-------------	---------	---------------	-----

Function: The CLC instruction which requires no operand resets the value in the carry flag of the status register to zero. This is most useful in preparation for an ADC instruction. See any of the examples using ADC for a demonstration.

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Observation	$B = D$	Phase Alignment	D
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	0.00	0.00	0.00
12	0.00	0.00	0.00
13	0.00	0.00	0.00
14	0.00	0.00	0.00
15	0.00	0.00	0.00
16	0.00	0.00	0.00
17	0.00	0.00	0.00
18	0.00	0.00	0.00
19	0.00	0.00	0.00
20	0.00	0.00	0.00
21	0.00	0.00	0.00
22	0.00	0.00	0.00
23	0.00	0.00	0.00
24	0.00	0.00	0.00
25	0.00	0.00	0.00
26	0.00	0.00	0.00
27	0.00	0.00	0.00
28	0.00	0.00	0.00
29	0.00	0.00	0.00
30	0.00	0.00	0.00
31	0.00	0.00	0.00
32	0.00	0.00	0.00
33	0.00	0.00	0.00
34	0.00	0.00	0.00
35	0.00	0.00	0.00
36	0.00	0.00	0.00
37	0.00	0.00	0.00
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	0.00	0.00	0.00
41	0.00	0.00	0.00
42	0.00	0.00	0.00
43	0.00	0.00	0.00
44	0.00	0.00	0.00
45	0.00	0.00	0.00
46	0.00	0.00	0.00
47	0.00	0.00	0.00
48	0.00	0.00	0.00
49	0.00	0.00	0.00
50	0.00	0.00	0.00
51	0.00	0.00	0.00
52	0.00	0.00	0.00
53	0.00	0.00	0.00
54	0.00	0.00	0.00
55	0.00	0.00	0.00
56	0.00	0.00	0.00
57	0.00	0.00	0.00
58	0.00	0.00	0.00
59	0.00	0.00	0.00
60	0.00	0.00	0.00
61	0.00	0.00	0.00
62	0.00	0.00	0.00
63	0.00	0.00	0.00
64	0.00	0.00	0.00
65	0.00	0.00	0.00
66	0.00	0.00	0.00
67	0.00	0.00	0.00
68	0.00	0.00	0.00
69	0.00	0.00	0.00
70	0.00	0.00	0.00
71	0.00	0.00	0.00
72	0.00	0.00	0.00
73	0.00	0.00	0.00
74	0.00	0.00	0.00
75	0.00	0.00	0.00
76	0.00	0.00	0.00
77	0.00	0.00	0.00
78	0.00	0.00	0.00
79	0.00	0.00	0.00
80	0.00	0.00	0.00
81	0.00	0.00	0.00
82	0.00	0.00	0.00
83	0.00	0.00	0.00
84	0.00	0.00	0.00
85	0.00	0.00	0.00
86	0.00	0.00	0.00
87	0.00	0.00	0.00
88	0.00	0.00	0.00
89	0.00	0.00	0.00
90	0.00	0.00	0.00

Function: The CLD instruction resets the D flag to zero, taking the Plus/4 out of decimal mode back into standard binary arithmetic. For an explanation of the decimal mode, see the SFD instruction.

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Operations	$\mathbb{R} \rightarrow \mathbb{R}$	Flags A/Excess	I
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Function: The CLI instruction clears the I flag and thus enables IRQ interrupts. No other flag is affected. For an explanation of interrupts, see the relevant section.

GLT (Clear Surface Mask)

Demand type	$\alpha = \beta$	Flows & interest	V
Constant demand	0	0	0
Linear demand	1	1	1
Quadratic demand	2	2	2
Cubic demand	3	3	3
Fourth-order demand	4	4	4
Fifth-order demand	5	5	5
Sixth-order demand	6	6	6
Seventh-order demand	7	7	7
Eighth-order demand	8	8	8
Ninth-order demand	9	9	9
Tenth-order demand	10	10	10
Eleventh-order demand	11	11	11
Twelfth-order demand	12	12	12
Thirteenth-order demand	13	13	13
Fourteenth-order demand	14	14	14
Fifteenth-order demand	15	15	15
Sixteenth-order demand	16	16	16
Seventeenth-order demand	17	17	17
Eighteenth-order demand	18	18	18
Nineteenth-order demand	19	19	19
Twentieth-order demand	20	20	20
Twenty-first-order demand	21	21	21
Twenty-second-order demand	22	22	22
Twenty-third-order demand	23	23	23
Twenty-fourth-order demand	24	24	24
Twenty-fifth-order demand	25	25	25
Twenty-sixth-order demand	26	26	26
Twenty-seventh-order demand	27	27	27
Twenty-eighth-order demand	28	28	28
Twenty-ninth-order demand	29	29	29
Thirtieth-order demand	30	30	30
Thirty-first-order demand	31	31	31
Thirty-second-order demand	32	32	32
Thirty-third-order demand	33	33	33
Thirty-fourth-order demand	34	34	34
Thirty-fifth-order demand	35	35	35
Thirty-sixth-order demand	36	36	36
Thirty-seventh-order demand	37	37	37
Thirty-eighth-order demand	38	38	38
Thirty-ninth-order demand	39	39	39
Fortieth-order demand	40	40	40
Forty-first-order demand	41	41	41
Forty-second-order demand	42	42	42
Forty-third-order demand	43	43	43
Forty-fourth-order demand	44	44	44
Forty-fifth-order demand	45	45	45
Forty-sixth-order demand	46	46	46
Forty-seventh-order demand	47	47	47
Forty-eighth-order demand	48	48	48
Forty-ninth-order demand	49	49	49
Fiftieth-order demand	50	50	50
Fifty-first-order demand	51	51	51
Fifty-second-order demand	52	52	52
Fifty-third-order demand	53	53	53
Fifty-fourth-order demand	54	54	54
Fifty-fifth-order demand	55	55	55
Fifty-sixth-order demand	56	56	56
Fifty-seventh-order demand	57	57	57
Fifty-eighth-order demand	58	58	58
Fifty-ninth-order demand	59	59	59
Sixtieth-order demand	60	60	60
Sixty-first-order demand	61	61	61
Sixty-second-order demand	62	62	62
Sixty-third-order demand	63	63	63
Sixty-fourth-order demand	64	64	64
Sixty-fifth-order demand	65	65	65
Sixty-sixth-order demand	66	66	66
Sixty-seventh-order demand	67	67	67
Sixty-eighth-order demand	68	68	68
Sixty-ninth-order demand	69	69	69
Seventieth-order demand	70	70	70
Seventy-first-order demand	71	71	71
Seventy-second-order demand	72	72	72
Seventy-third-order demand	73	73	73
Seventy-fourth-order demand	74	74	74
Seventy-fifth-order demand	75	75	75
Seventy-sixth-order demand	76	76	76
Seventy-seventh-order demand	77	77	77
Seventy-eighth-order demand	78	78	78
Seventy-ninth-order demand	79	79	79
Eightieth-order demand	80	80	80
Eighty-first-order demand	81	81	81
Eighty-second-order demand	82	82	82
Eighty-third-order demand	83	83	83
Eighty-fourth-order demand	84	84	84
Eighty-fifth-order demand	85	85	85
Eighty-sixth-order demand	86	86	86
Eighty-seventh-order demand	87	87	87
Eighty-eighth-order demand	88	88	88
Eighty-ninth-order demand	89	89	89
Ninetieth-order demand	90	90	90
Ninety-first-order demand	91	91	91
Ninety-second-order demand	92	92	92
Ninety-third-order demand	93	93	93
Ninety-fourth-order demand	94	94	94
Ninety-fifth-order demand	95	95	95
Ninety-sixth-order demand	96	96	96

Function: The CLV instruction simply asserts the overflow flag of the SR to zero. Although this is not of any use for arithmetic operations, it can be used to produce a JMP offset using a CLV followed by a BVC. The use of this is that such a command can work when it is placed anywhere in memory whereas a JMP instruction will only work in the address for which it was intended. The example below is equivalent to JMP \$6010.

Example:	A008 CLV	*Clear the Overflow flag
	RMC 0010	*Branch to RMC

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Year of completion	Number registered	Accreditation body	Country
1999-2000	10	EFMD	France
2000-2001	10	EFMD	France
2001-2002	10	EFMD	France
2002-2003	10	EFMD	France
2003-2004	10	EFMD	France
2004-2005	10	EFMD	France
2005-2006	10	EFMD	France
2006-2007	10	EFMD	France
2007-2008	10	EFMD	France
2008-2009	10	EFMD	France
2009-2010	10	EFMD	France
2010-2011	10	EFMD	France
2011-2012	10	EFMD	France
2012-2013	10	EFMD	France
2013-2014	10	EFMD	France
2014-2015	10	EFMD	France
2015-2016	10	EFMD	France
2016-2017	10	EFMD	France
2017-2018	10	EFMD	France
2018-2019	10	EFMD	France
2019-2020	10	EFMD	France
2020-2021	10	EFMD	France
2021-2022	10	EFMD	France
2022-2023	10	EFMD	France
2023-2024	10	EFMD	France
2024-2025	10	EFMD	France
2025-2026	10	EFMD	France
2026-2027	10	EFMD	France
2027-2028	10	EFMD	France
2028-2029	10	EFMD	France
2029-2030	10	EFMD	France
2030-2031	10	EFMD	France
2031-2032	10	EFMD	France
2032-2033	10	EFMD	France
2033-2034	10	EFMD	France
2034-2035	10	EFMD	France
2035-2036	10	EFMD	France
2036-2037	10	EFMD	France
2037-2038	10	EFMD	France
2038-2039	10	EFMD	France
2039-2040	10	EFMD	France
2040-2041	10	EFMD	France
2041-2042	10	EFMD	France
2042-2043	10	EFMD	France
2043-2044	10	EFMD	France
2044-2045	10	EFMD	France
2045-2046	10	EFMD	France
2046-2047	10	EFMD	France
2047-2048	10	EFMD	France
2048-2049	10	EFMD	France
2049-2050	10	EFMD	France
2050-2051	10	EFMD	France
2051-2052	10	EFMD	France
2052-2053	10	EFMD	France
2053-2054	10	EFMD	France
2054-2055	10	EFMD	France
2055-2056	10	EFMD	France
2056-2057	10	EFMD	France
2057-2058	10	EFMD	France
2058-2059	10	EFMD	France
2059-2060	10	EFMD	France
2060-2061	10	EFMD	France
2061-2062	10	EFMD	France
2062-2063	10	EFMD	France
2063-2064	10	EFMD	France
2064-2065	10	EFMD	France
2065-2066	10	EFMD	France
2066-2067	10	EFMD	France
2067-2068	10	EFMD	France
2068-2069	10	EFMD	France
2069-2070	10	EFMD	France
2070-2071	10	EFMD	France
2071-2072	10	EFMD	France
2072-2073	10	EFMD	France
2073-2074	10	EFMD	France
2074-2075	10	EFMD	France
2075-2076	10	EFMD	France
2076-2077	10	EFMD	France
2077-2078	10	EFMD	France
2078-2079	10	EFMD	France
2079-2080	10	EFMD	France
2080-2081	10	EFMD	France
2081-2082	10	EFMD	France
2082-2083	10	EFMD	France
2083-2084	10	EFMD	France
2084-2085	10	EFMD	France
2085-2086	10	EFMD	France
2086-2087	10	EFMD	France
2087-2088	10	EFMD	France
2088-2089	10	EFMD	

Addressing Modes:	CMP #Shb	CMP Shb	CMP Shb,X	CMP Shb#n
	CMP Shb#X	CMP Shb#Y	CMP Shb#Y	CMP Shb#Z

Function: The CMP instruction is used to compare a value with the accumulator in order to find which is larger, smaller, or if they are the same. The bits of the status flag are set above.

IF A VALUE THEN 501 300 000

IF A VALUE THEN SAY 21 END

IF A Value TRIM And Join On

Combinations of these values are also possible, for instance just testing `C` shows that `A` is greater than or equal to the operand value. Once the `CMPL` instruction has been carried out, you can test the settings of the flags and perform a branch accordingly. The example adds three to the accumulator until the result reaches 160.

Example: 6000 LDA # 000	Load A with value 0
CLC	Clear carry flag for addition
INC # 000	Add value 1 to accumulator
CMP # 0A0	Compare A to value 160
JBC 00000	If A < 160 jump to 00000
BBC 00000	If A < 160 - carry to 00000

[illegible]

Classification:	No Effect	Class A/B/C/D	Class E/F/G
1. (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z) (aa) (ab) (ac) (ad) (ae) (af) (ag) (ah) (ai) (aj) (ak) (al) (am) (an) (ao) (ap) (aq) (ar) (as) (at) (au) (av) (aw) (ax) (ay) (az) (ba) (bb) (bc) (bd) (be) (bf) (bg) (bh) (bi) (bj) (bk) (bl) (bm) (bn) (bo) (bp) (bq) (br) (bs) (bt) (bu) (bv) (bw) (bx) (by) (bz) (ca) (cb) (cc) (cd) (ce) (cf) (cg) (ch) (ci) (cj) (ck) (cl) (cm) (cn) (co) (cp) (cq) (cr) (cs) (ct) (cu) (cv) (cw) (cx) (cy) (cz) (da) (db) (dc) (dd) (de) (df) (dg) (dh) (di) (dj) (dk) (dl) (dm) (dn) (do) (dp) (dq) (dr) (ds) (dt) (du) (dv) (dw) (dx) (dy) (dz) (ea) (eb) (ec) (ed) (ee) (ef) (eg) (eh) (ei) (ej) (ek) (el) (em) (en) (eo) (ep) (eq) (er) (es) (et) (eu) (ev) (ew) (ex) (ey) (ez) (fa) (fb) (fc) (fd) (fe) (ff) (fg) (fh) (fi) (fj) (fk) (fl) (fm) (fn) (fo) (fp) (fq) (fr) (fs) (ft) (fu) (fv) (fw) (fx) (fy) (fz) (ga) (gb) (gc) (gd) (ge) (gf) (gg) (gh) (gi) (gj) (gk) (gl) (gm) (gn) (go) (gp) (gq) (gr) (gs) (gt) (gu) (gv) (gw) (gx) (gy) (gz) (ha) (hb) (hc) (hd) (he) (hf) (hg) (hh) (hi) (hj) (hk) (hl) (hm) (hn) (ho) (hp) (hq) (hr) (hs) (ht) (hu) (hv) (hw) (hx) (hy) (hz) (ia) (ib) (ic) (id) (ie) (if) (ig) (ih) (ii) (ij) (ik) (il) (im) (in) (io) (ip) (iq) (ir) (is) (it) (iu) (iv) (iw) (ix) (iy) (iz) (ja) (jb) (jc) (jd) (je) (jf) (jg) (jh) (ji) (jj) (jk) (jl) (jm) (jn) (jo) (jp) (jq) (jr) (js) (jt) (ju) (jv) (jw) (jx) (jy) (jz) (ka) (kb) (kc) (kd) (ke) (kf) (kg) (kh) (ki) (kj) (kk) (kl) (km) (kn) (ko) (kp) (kq) (kr) (ks) (kt) (ku) (kv) (kw) (kx) (ky) (kz) (la) (lb) (lc) (ld) (le) (lf) (lg) (lh) (li) (lj) (lk) (ll) (lm) (ln) (lo) (lp) (lq) (lr) (ls) (lt) (lu) (lv) (lw) (lx) (ly) (lz) (ma) (mb) (mc) (md) (me) (mf) (mg) (mh) (mi) (mj) (mk) (ml) (mm) (mn) (mo) (mp) (mq) (mr) (ms) (mt) (mu) (mv) (mw) (mx) (my) (mz) (na) (nb) (nc) (nd) (ne) (nf) (ng) (nh) (ni) (nj) (nk) (nl) (nm) (nn) (no) (np) (nq) (nr) (ns) (nt) (nu) (nv) (nw) (nx) (ny) (nz) (oa) (ob) (oc) (od) (oe) (of) (og) (oh) (oi) (oj) (ok) (ol) (om) (on) (oo) (op) (oq) (or) (os) (ot) (ou) (ov) (ow) (ox) (oy) (oz) (pa) (pb) (pc) (pd) (pe) (pf) (pg) (ph) (pi) (pj) (pk) (pl) (pm) (pn) (po) (pp) (pq) (pr) (ps) (pt) (pu) (pv) (pw) (px) (py) (pz) (qa) (qb) (qc) (qd) (qe) (qf) (qg) (qh) (qi) (qj) (qk) (ql) (qm) (qn) (qo) (qp) (qq) (qr) (qs) (qt) (qu) (qv) (qw) (qx) (qy) (qz) (ra) (rb) (rc) (rd) (re) (rf) (rg) (rh) (ri) (rj) (rk) (rl) (rm) (rn) (ro) (rp) (rq) (rr) (rs) (rt) (ru) (rv) (rw) (rx) (ry) (rz) (sa) (sb) (sc) (sd) (se) (sf) (sg) (sh) (si) (sj) (sk) (sl) (sm) (sn) (so) (sp) (sq) (sr) (ss) (st) (su) (sv) (sw) (sx) (sy) (sz) (ta) (tb) (tc) (td) (te) (tf) (tg) (th) (ti) (tj) (tk) (tl) (tm) (tn) (to) (tp) (tq) (tr) (ts) (tt) (tu) (tv) (tw) (tx) (ty) (tz) (ua) (ub) (uc) (ud) (ue) (uf) (ug) (uh) (ui) (uj) (uk) (ul) (um) (un) (uo) (up) (uq) (ur) (us) (ut) (uu) (uv) (uw) (ux) (uy) (uz) (va) (vb) (vc) (vd) (ve) (vf) (vg) (vh) (vi) (vj) (vk) (vl) (vm) (vn) (vo) (vp) (vq) (vr) (vs) (vt) (vu) (vv) (vw) (vx) (vy) (vz) (wa) (wb) (wc) (wd) (we) (wf) (wg) (wh) (wi) (wj) (wk) (wl) (wm) (wn) (wo) (wp) (wq) (wr) (ws) (wt) (wu) (wv) (ww) (wx) (wy) (wz) (xa) (xb) (xc) (xd) (xe) (xf) (xg) (xh) (xi) (xj) (xk) (xl) (xm) (xn) (xo) (xp) (xq) (xr) (xs) (xt) (xu) (xv) (xw) (xx) (xy) (xz) (ya) (yb) (yc) (yd) (ye) (yf) (yg) (yh) (yi) (yj) (yk) (yl) (ym) (yn) (yo) (yp) (yq) (yr) (ys) (yt) (yu) (yv) (yw) (yx) (yy) (yz) (za) (zb) (zc) (zd) (ze) (zf) (zg) (zh) (zi) (zj) (zk) (zl) (zm) (zn) (zo) (zp) (zq) (zr) (zs) (zt) (zu) (zv) (zw) (zx) (zy) (zz)			

Addressing Mode	CPX = 500	CPX = 500	CPX = 5000
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Function: The CPX instruction performs an identical operation to CMP except that the comparison takes place between the *X* register and the specified operand value. The settings of the flags are identical to those for CMP.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Operation	No Effect	Flare Ahead	N 2.0
1.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0
3.0	0.0	0.0	0.0
4.0	0.0	0.0	0.0
5.0	0.0	0.0	0.0
6.0	0.0	0.0	0.0
7.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0
13.0	0.0	0.0	0.0
14.0	0.0	0.0	0.0
15.0	0.0	0.0	0.0
16.0	0.0	0.0	0.0
17.0	0.0	0.0	0.0
18.0	0.0	0.0	0.0
19.0	0.0	0.0	0.0
20.0	0.0	0.0	0.0
21.0	0.0	0.0	0.0
22.0	0.0	0.0	0.0
23.0	0.0	0.0	0.0
24.0	0.0	0.0	0.0
25.0	0.0	0.0	0.0
26.0	0.0	0.0	0.0
27.0	0.0	0.0	0.0
28.0	0.0	0.0	0.0
29.0	0.0	0.0	0.0
30.0	0.0	0.0	0.0
31.0	0.0	0.0	0.0
32.0	0.0	0.0	0.0
33.0	0.0	0.0	0.0
34.0	0.0	0.0	0.0
35.0	0.0	0.0	0.0
36.0	0.0	0.0	0.0
37.0	0.0	0.0	0.0
38.0	0.0	0.0	0.0
39.0	0.0	0.0	0.0
40.0	0.0	0.0	0.0
41.0	0.0	0.0	0.0
42.0	0.0	0.0	0.0
43.0	0.0	0.0	0.0
44.0	0.0	0.0	0.0
45.0	0.0	0.0	0.0
46.0	0.0	0.0	0.0
47.0	0.0	0.0	0.0
48.0	0.0	0.0	0.0
49.0	0.0	0.0	0.0
50.0	0.0	0.0	0.0
51.0	0.0	0.0	0.0
52.0	0.0	0.0	0.0
53.0	0.0	0.0	0.0
54.0	0.0	0.0	0.0
55.0	0.0	0.0	0.0
56.0	0.0	0.0	0.0
57.0	0.0	0.0	0.0
58.0	0.0	0.0	0.0
59.0	0.0	0.0	0.0
60.0	0.0	0.0	0.0
61.0	0.0	0.0	0.0
62.0	0.0	0.0	0.0
63.0	0.0	0.0	0.0
64.0	0.0	0.0	0.0
65.0	0.0	0.0	0.0
66.0	0.0	0.0	0.0
67.0	0.0	0.0	0.0
68.0	0.0	0.0	0.0
69.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0
71.0	0.0	0.0	0.0
72.0	0.0	0.0	0.0
73.0	0.0	0.0	0.0
74.0	0.0	0.0	0.0
75.0	0.0	0.0	0.0
76.0	0.0	0.0	0.0
77.0	0.0	0.0	0.0
78.0	0.0	0.0	0.0
79.0	0.0	0.0	0.0
80.0	0.0	0.0	0.0
81.0	0.0	0.0	0.0
82.0	0.0	0.0	0.0
83.0	0.0	0.0	0.0
84.0	0.0	0.0	0.0
85.0	0.0	0.0	0.0
86.0	0.0	0.0	0.0
87.0	0.0	0.0	0.0
88.0	0.0	0.0	0.0
89.0	0.0	0.0	0.0
90.0	0.0	0.0	0.0
91.0	0.0	0.0	0.0
92.0	0.0	0.0	0.0

Addressing Mode:	CPY = 0000	CPY = 0001	CPY = 0010
---------------------	------------	------------	------------

Function: The CPY instruction performs an identical operation to CMP except that the comparison takes place between the *y* register and the specified operand value. The semantics of the flags are identical to those for CMP.

11/11/11 11:11:11 AM 11/11/11 11:11:11 AM

Operations:	M-1 → M	Flags Altered:	N, Z
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AddressingDEC	DEC Sub-X	DEC SubH	DEC SubW
Mode: 5th			SubW X

Function: The DECC instruction is used to decrease the value stored in a memory location by 1, as if you had subtracted one from it. The result of the decrement is stored back in the source location. If the value is decremented past zero it becomes 255. The Z flag is set if the result is > 127, and the S flag set if the result after the decrement is zero. The instruction does not set the carry flag like ADD and SUB. The example below decreases the border colour until it becomes black, i.e. 05.

Example: 6000 DEC SFF19 'Decrement border colour in SFF19
 BNE \$0000 'If result < > 0 jump to \$0000
 BRK 'Result = 0 - Return to TEDMON

DEC (Decrement X)

Operation: $X-1 \rightarrow X$ Flags Altered: N,Z

Function: The value currently in the X register is decremented by one and returned to the X register. As for DEC, if the result goes below zero, it becomes 255. The N and Z flags are set in the same way as by the DEC command. The example below uses the DEC instruction to provide short pause in the running of a program.

Example: 6000 LDY # 0 'Load Y with initial value 0
 DEC 'Decrement value in X
 BNE \$0002 'If result < > 0 jump to \$0002
 BRK 'Return = 0 - return to TEDMON

DEY (Decrement Y)

Operation: $Y-1 \rightarrow Y$ Flags Altered: N,X

Function: The DEY instruction performs an identical action to DEC except that it operates on the Y index register. The example program for DEC will work equally well if LDY and DEC are replaced by DEY and DEY. Settings of flags are as for DEC.

EOR (Perform Exclusive-Or On Accumulator)

Operation: $A \oplus OR M \rightarrow A$ Flags Altered: N,Z

Function: Those bits that are set to one in either the accumulator or the specified operand are set to one. Those bits which are both zero in accumulator and operand are set to zero. Those bits which are set to one in both accumulator and operand are set to zero. The resultant byte is left in the accumulator. If the result is > 127, N is set, and if the result is zero, Z is set. The EOR instruction has the effect of toggling bits in a byte.

INC (Increment Memory)

Operation: $M+1 \rightarrow M$ Flags Altered: N,Z

Addressing INC INC \$00,X INC \$000,X INC \$000,X
 Mode: \$00 \$000 \$000,X \$000,X

Function: The INC instruction does the opposite of the DEC instruction, adding one to the value stored in a specified memory location. The result after the incrementation is stored back in the source location. If the value is incremented past 255, it returns to zero. The N flag is set if the result is > 127, and the Z flag if the result is zero. The example below increments the border colour and it goes past 255 back to 0 (black).

Example: 6000 INC SFF19 'Increment border colour in SFF19
 BNE \$0000 'If result < > 0 jump to \$0000
 BRK 'Result = 0 - return to TEDMON

INX (Increment X)

Operation: $X+1 \rightarrow X$ Flags Altered: N,Z

Function: The INX instruction performs the same operation as INC except that it increments the X register rather than a memory location. The operation and flag settings other than this are identical to INC. The example below

increments the value originally in the X register until it reaches 192.

Example: 6000 INX 'Increment value in X register
 CPX # \$C0 'Compare value in X to 192
 BNE \$0000 'If X < > 192 jump to \$0000
 BRK 'X = 192 - return to TEDMON

JMP (Jump To Location)

Operation: $M \rightarrow PC$ Flags Altered: None

Function: The JMP instruction is used to change program flow to a specified address, like the BASIC GOTO command. None of the flag or register settings are changed. The jump is unconditional and is not limited to the -128, +127 range imposed on branch instructions. The example below just jumps back to itself for ever!

Example: 6000 JMP \$0000 'Jump unconditionally to \$0000

JSR (Jump To Sub-Routine)

Operation: $PC+2 \rightarrow Stack, M \rightarrow PC$ Flags None Altered:

Addressing Mode: JSR \$0000

Function: The JSR instruction is equivalent to the GOSUB command in BASIC. First the address to which control must return after the sub-routine is pushed onto the stack, and then a jump is carried out to the specified absolute address. When a subsequent RTS is found, the return address is pulled back off the stack and jumped to. The example below calls a short routine to increment the border colour, then ends.

Example: 6000 JSR \$0004 'Jump to sub-routine at \$0004
 BRK 'Return to TEDMON
 INC SFF19 'Sub-routine - increment border colour
 RTS 'Return from sub-routine

LDA (Load Accumulator)

Operation: $M \rightarrow A$ Flags Altered: N,Z

and 150 of infinity.

Example: 6000 LDA SFF15 'Load A with background colour in SFF15
 EOR # 1FF 'Toggle every bit in byte
 STA SFF15 'Store back in background colour
 JMP \$0000 'Loop back to start

Addressing Mode:

LDA # \$00 LDA \$00 LDA \$00,X LDA \$00,X
 LDA \$000 LDA \$000,X LDA \$000,X
 LDA (\$00,X) LDA (\$00),Y

Function: The LDA instruction is used to transfer a value to the accumulator. The specified operand value is loaded into the accumulator. The N flag is set if the value is > 127, and Z is set if the value is zero. The source value is not affected. For examples, see any of the example programs using the instruction.

LDX (Load X)

Operation: $M \rightarrow X$ Flags Altered: N,Z

Addressing Modes:

LDS #Shb LDS Shb LDS Shb,Y
LDS Shhh LDA Shhh,Y

The LDS instruction is identical in use to LDA, except the specified value is loaded into the X register.

LDY (Load Y)

Operation: M → Y Flags Altered: N,Z

Addressing Modes:

LDY #Shb LDY Shb LDY Shb,X
LDY Shhh LDA Shhh,X

Function: The LDY instruction is identical in use to LDA, but the specified value is loaded into the Y index register.

LSR (Logical Shift Right)

Operation: $0 \rightarrow [C] \rightarrow C$ Flags Altered: N,Z,C

Addressing: LSR LSR LSR LSR
Modes: Shb,X Shhh Shhh,X

Function: The LSR instruction performs the opposite of the ASL instruction. All the bits within the accumulator or memory location are shifted to the right. Bit 0 falls out into the carry flag, and bit 7 is replaced with zero. This has the effect of dividing a number by two with the binary carry bit being left in the carry flag. The example below calculates 192/8.

Example: 6000 LDA #C9 'Load A with value 192
 LSR 'Shift A right (/2)
 LSR 'Shift A right (/2)
 LSR 'Shift A right (/2)
 BRK 'Return to TEDMON

NOP (Null Operation)

Operation: None Flags Altered: None

Function: The NOP instruction simply does nothing - it does not affect any register or flag, and creates a time delay of 1 clock cycles. The instruction is often used either to give a space between sections of a program or to replace other instructions during debugging.

ORA (Perform Logical OR)

Operation: A OR M → A Flags Altered: N,Z

Addressing: ORA ORA Shb ORA ORA
Modes: #Shb Shb,X Shhh,Y
 ORA ORA Shhh,X ORA
 Shhh,X Shhh,Y (Shb,X) (Shb,Y)

Function: All the bits which are set to zero in both accumulator and operand byte are set to zero. All bits which are set to one in either or both of the accumulator and operand are set to one. The result is left in the accumulator. The N and Z flags are set as for the AND instruction. The example below sets bit 7 of the character at the start of the screen, so reversing it.

Example: 6000 LDA #0C00 'Load accumulator from screen byte
 ORA #50 'Set bit 7 (OR with value 128)
 STA #0C00 'Return byte to screen
 BRK 'Return to TEDMON

PHA (Push Accumulator Onto Stack)

Operation: A → Stack Flags Altered: None

Function: The PHA instruction is used to push the value currently in the accumulator onto the machine stack. Once there, it can be pulled back into the accumulator using PLA. For information on the stack, see the relevant section. The example below uses a push and then pull to set up the status register flags.

Example: 6000 PHA 'Push value in accumulator onto stack

 PLA 'Pull value back off stack & set flags
 BRK 'Return to TEDMON

PHP (Push Processor Status Register Onto Stack)

Operation: SR → Stack Flags Altered: None

Function: The PHP instruction does the same as the PHA instruction except that it is the status register which is pushed onto the stack rather than the accumulator. This is useful for two purposes: retaining the status register when calling a sub-routine and examining the status register by pushing PHP and pulling PLA.

PLA (Pull Accumulator From Stack)

Operation: Stack → A Flags Altered: N,Z

Function: The PLA instruction pulls a value off the stack into the accumulator previously pushed on using the PHA instruction. The N and Z flags are set in accordance with the manner for the LDA instruction. For an example, see PHA.

ROL (Rotate Left)

Operation: $C \rightarrow [C] \rightarrow C$ Flags Altered: N,Z,C

Addressing: ROL ROL Shb ROL ROL
Modes: Shb,X Shhh Shhh,X
 ROL Shhh,X

Function: Bit 7 of the accumulator or memory location is shifted into the carry flag. Bits 6 through 1 are shifted left one bit, and the carry flag before the operation is shifted into bit 0. The result is left either in the accumulator or in the memory location specified. If the result is > 127, N is set and if the result is zero, Z is set. The example below uses ROL and ASL to multiply a 16-bit number by two. The low byte (SHLL) is stored in SD0 and the high byte (SHHH) in SD1.

Example: 6000 ASL SD0 'Shift low byte in SD0 left (*2)
 ROL SD1 'Rotate high byte + carry left (*2)
 BRK 'Return to TEDMON

ROR (Rotate Right)

Operation: $C \rightarrow [C] \rightarrow C$ Flags Altered: N,Z,C

Function: The ROR command does the opposite of ROL. Bit 0 is shifted into the carry flag. Bits 6 through 1 are shifted right one bit, and bit 7 is replaced by the carry flag prior to the operation. This can be used in conjunction with LSR to perform two-byte division by two. The example below divides the 16-bit value in SD0 (low) and SD1 (high) by two.

■ FOUR GROUND

the actual number is the contents of the address specified and not the address itself.

Implied Mode. With implied mode, no operand is specified. In a command like TCA or PHA, the location of the data byte is implied by the command. Also, commands like ASL or ROL can be used implied because shifting the operand chooses the accumulator as the data location.

Immediate Mode [nBbbb]. In immediate mode, you specify the byte number directly rather than as an address.

Absolute Mode [Bbbb]. In absolute mode, you simply specify an address of a memory location in the range 0-65535. The byte operand is then defined as the contents of the location you have specified.

Zero Page Mode [Bbb]. Zero page mode is identical to absolute mode except that the address you specify can only be between 0 and 255. The advantage of using this mode is that it is faster, and because the operand is 8-bit instead of 16-bit, the command takes up one byte less than when using absolute mode.

Relative Mode. Relative mode is that used for all branch instructions. The idea is that instead of specifying an absolute address, you provide an offset which is added to the current address to find the destination. The programmer never has to worry about how this offset is calculated as TEDMON does the calculation for you.

Indirect Mode [BbbbX]. Indirect mode can only be used by one command, the JMP instruction. The 7801 looks at the absolute address you specify, and gets its jump address from there. The final address is stored with low byte (BbbLL) at the location specified, and the high byte (BbbHH) at the next location on.

Absolute Indirect Mode [BbbbX/BbbbY]. Absolute indirect mode calculates the address from which to get a byte by adding the value stored in the index register you specify to the base address. Thus if X is set to 14, LDA \$1200,X would get a byte from the address \$1214.

Zero Page Indirect Mode [BbbX/BbbY]. Zero Page indirect addressing is the same as absolute indirect except that the base address can be between 0 and 255 instead of 0 and 65535. The advantage is speed and compactness.

Indirect Indirect Mode [BbbbX]. Indirect indirect mode, sometimes called post-index indirect mode is a little more complex. The address Bbb is a zero page address (0-255). The base address is found in Bbb (low byte) and Bbb+1 (high byte). From then on, the mode works like absolute indirect mode. BbbbX with Bbbb being the address found at Bbb in zero page. The X register is added to the address to give the final address.

Indexed Indirect Mode [BbbX]. Indexed indirect mode, sometimes called pre-indexed indirect mode is a little strange. The address location is calculated that: The zero page address Bbb is added to the value in X. A base address is then loaded from the zero page address Bbb+X, and this forms the final 16-bit address. The mode consists of limited value, and I have never myself seen a program on any 7801-type processor using the mode!

Plus/4 ROM/RAM Paging Considerations For Data Transfer

Most computers, such as the BBC Micro have only one memory map. That is to say that RAM extends from \$0000-\$FFFF and ROM from \$8000-\$FFFF. The Plus/4 however is more flexible than that. It has RAM from \$0000-\$FFFF, but the area from \$8000 onwards can either be RAM or ROM, giving the computer a full 64K of RAM. You can choose to have ROM at \$8000 by doing a STA

\$FFFE, and ROM by doing a STA \$FFFF. All LDA, JSR etc. operations work on the current type of memory, ROM or RAM. Note that when using RAM at \$8000 onwards, you must disable interrupts first. The two programs below would appear at first to do the same thing, but the first loads the accumulator with a byte from ROM and the second from RAM, by using the STA instructions to page RAM or ROM in.

```
Program 1:  SET
            STA $FFFE
            LDA $8000
            STA $FFFE
            CLI
            BRK
```

```
Program 2:  SET
            STA $FFFF
            LDA $8000
            STA $FFFE
            CLI
            BRK
```

The simple method of choosing between ROM and RAM configurations makes the Plus/4 far more powerful than standard single memory map computers.

An Introduction To Plus/4 7501 Interrupts

Interrupts seem to frighten many people, but are really nothing to fear. Interrupts are just what they sound like - interrupts! You can program your Plus/4 so that whenever a specific event occurs, it interrupts the main program which is running, and says "Hang on a minute, I'm sorry to interrupt but I've got something important to do now so you'll have to wait until I've finished." Your program, called the interrupt handler can then do whatever it wants, then it returns control back to the main program which continues running as if nothing had happened.

There are several different events which can be used to generate interrupts, but here we will consider only the simplest, what are called timer interrupts. Normally, interrupts are used on the Plus/4 to keep the system clock read by TI and TD running. Every time the screen on your TV or monitor is redrawn, an interrupt is generated. This occurs every 50th of a second in the UK. When this interrupt is generated, a JMP instruction is done: JMP (\$0114), \$0114 being a "vector" containing the address at which an interrupt handler can be found. Then, a routine in the ROM of your Plus/4 updates the clock, scans the keyboard and does miscellaneous other work. This means that you can get your own program to run at the same time as Basic, by changing the address stored in \$0114. The program below sets up interrupts so that every 50th of a second, the border colour is incremented.

```
$8000 SET      'Disable interrupts for setup
            LDA # $0D      'Load A with low byte of $800D
            STA $0114      'Store low byte in interrupt vector
            LDA # $84      'Load A with high byte of $800D
            STA $0115      'Store high byte in interrupt vector
            CLI             'Re-enable interrupts
            RTS            'Return to BASIC
            PMP            'Interrupt Handler - Push SR to stack
            INC $FF19      'Increment border colour
            PULP           'Pull SR back off stack
            JMP $C00E      'Return to ROM interrupt handler
```

The program can be entered into TEDMON and then

called by cXiting to Basic and doing a SYS DEFC ("5000") to enable the routine (equivalent to G50000). From then on, everything works normally, but the border colour changes colour rapidly. This is how the program works.

The first action just changes the address at \$0014-\$0015 to point to our program at \$0040. When you change this address, you should always stop interrupts first, and re-enable them when you're done. The interrupt handler routine now in action first saves the SR on the stack. Any routine used as an interrupt handler must preserve the contents of all the registers so they should be pushed into the stack and then restored at the end of the routine, hence the PLP. Control is then returned to the ROM by a JMP \$C906 into the ROM interrupt handler. This allows the ROM's routine to work, to keep the keyboard active and to update the clock.

And that's really all there is to it! Obviously, there are many ways in which interrupts can be used other than this simple demonstration, and the scope of the subject is really beyond this magazine, but once you grasp the basic

principle, you should have no problem going onto more complex uses.

Bibliography And Final Word...

I hope from this short series I have given you an appetising taste of machine code and a foundation knowledge. We have only covered the simpler aspects of machine language programming due to lack of space, and you will probably find this course most useful accompanied by a few reference books. The books I used to write the introduction to machine-code, and which I would recommend are: "Programmer's Reference Guide For The Plus/4" ISBN 0-471-12404-5 (Scott Foresman & Company)

"C/C++ Plus/4 Reference Book" (Amey) ISBN 1-717-00104-5

"The Complete Commodore 16 ROM Disassembly" ISBN 0-315-20044-6 (Blackworth)

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W	R	J	T	E	I	M	C	N	T	J	R	M	T	G	R	N	S	S	J
Y	R	S	M	N	C	S	P	R	S	S	Y	V	T	S	R	N	S	S	J
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I	S	S	O	V	N	S	I	S	O	I	C	I	A	S	T	S	S	J	
O	J	S	T	O	R	S	O	R	S	O	R	S	O	R	S	O	R	S	J

WINNERS — CLEVELANDS — CHALKS — COMPTON
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Name: _____
Address: _____

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Put pen to paper and tell us your news, views and groans

Dear WC

I feel that I must write and express my views.

I purchased a C16 in 1984 and enjoyed the scope of this machine so much that the following year I bought a Plus/4, and am still impressed by its capabilities.

However, things might have been different if I had known at the time that both of these machines were only a stop-gap until the C128 and Amiga were developed more.

Although I am satisfied with the Plus/4, the software manufacturers appear not to be, support for the machine has been poor. It is picking up slowly now but the demand will never be as great as for the C64, because it lacks the numbers game.

So, why not help all these C16 and Plus/4 owners and compile a C16-Plus/4 edition of *Your Commodore*, you already have the material to hand, so why not re-cycle and up-date a selection of articles from the last five years' magazines. Your range of material must be vast, therefore this edition would appeal to all levels of operators.

Perhaps if you did run such an edition, you might influence some software manufacturers to think again - not such a bad idea?

K. Williams, Gt. Yarmouth, Norfolk

I agree wholeheartedly with you. The Plus/4 is a very much underrated machine.

However, you cannot simply just produce a one off magazine like this every so often. In fact, we have already published the 'Your Commodore C16 and Plus/4 essential guide', back in 1983. On top of this, we have to date got no less than 5 disks of Plus/4 software available through our Readers Service department. The fact of the matter is this, like any other commodity, computers and computer software rely on supply and demand. I think that the following will clearly show what I mean.

At the moment, I have 114 readers submissions awaiting publication. This figure can be broken down as follows:

C64 = 141; C128 = 4; Amiga = 1; Plus/4 = 5. (C16 is in it.)

Dear VC

Could you, through your letters pages, please help me solve one of life's great mysteries.

I have been searching this fair land of ours for some 18 months now, for a copy of the instruction manual for the Cerech Speech Cartridge. Unfortunately, my efforts have proved fruitless. I am turning to you as a last resort. Could you please publish my plea for any help in this matter. Thank you.

Ken Cole, 31 Hamstead House, Roseberry Street, London SE26 5NZ

Thanks for the letter. Here goes...

Come on now you lot out there, someone must be able to help our Ken. Any help would be most appreciated. Please send all replies direct to Ken and not to Your Commodore. Thank you.

Dear VC

The reason for this letter is simple. I am a dedicated C/6-Plus/4 user. Therefore, I have started a C/6-Plus/4 club. The club intends to produce a monthly magazine which will include Program listings, Tips, Hints, Tricks and Reviews.

If there are any C/6-Plus/4 owners that would like to join the club, they can write to me at the address below for details. I would like to add that any C/6-Plus/4 users can join, no matter what age, sex, level of competence you are.

R. Robinson, 112 Cliff Road, Harrow, North Hantside, HU14 1JE.

Thanks for your letter. It is nice to see that someone is actually doing something positive for a change. Good luck with the venture.

Dear VC

I was interested to read your review article about the LC-10C colour printer. I purchased one about a month ago. On arrival, a small part of the membrane key system was dented, which was of course no matter to the control as print output. But after 3-4 colour printouts, two lines changed in colour, then 8-9 not ones (in Black), in NLQ, the NLQ failed to deliver shaft quality! I therefore phoned Star and spoke to someone that sounded like a young girl assistant. I do not think she understood what I explained to her. I later spoke to someone that appeared to be more technically minded. We both agreed that the ribbon should last for more than those few printouts at NLQ, this was at 11:30 in the morning. At 11:45 the next morning a replacement colour ribbon arrived by post. How's that for excellent after sales service?? (11 out of 10 to Star).

I wrote back with my thanks, and the following suggestions:

1. The clear part of the plastic cover should be removable in addition to the rest of the plastic cover. This lets one see the print as it is made.
2. As far as I know, only fanfold paper can be scrolled back by the printer, to the top of the page. Single sheets do not obey the command. It should be made possible for single sheets.
3. I found out that if one pulls the release lever to use then 'backs' the single sheet with the first sheet of fanfold paper, then the command for the printer to return both the single sheet together with the first sheet of the fanfold paper does work. The fanfold sheet is the first of several sheets of the fanfold stack. The purpose of all this?? One can print in more detailed graphics to pin detail.

J. Bradley, Lancashire, Scotland.

Thank you for your comments regarding the review. I have tried your suggestion regarding the scrolling and it does appear to work just fine. Thanks for the tips.

128 CORNER

Cry for help

Dear 128 Corner,
I wonder if you or any of your readers can help me. When using my 128 in CP/M mode I am unable to display the Pound sterling sign on either the Screen or the printer.

On pressing the POUND key I get a Hash sign (#) displayed instead. Just as if I had pressed the Hash key.

If you can solve this problem it would make life easier for me as at the moment when in CP/M I have to type Pounds sterling.

I use a Wordprocessor called VIDE13 which I obtained from the Public domain, (I am writing this with it) which I think is very good, but would be even better if I could use the POUND sign.

I would also like to know if it is possible to change the Character colour from purple on booting CP/M. Can I change the colour from within a profile sub file, as I have put this file on my CP/M boot disk so as to ask me the Date and time on booting CP/M.

Your Commodore is a brilliant Mag for Commodore users and the 128 Corner is a great idea, its encouraged me to write to you, and I hope you are able to keep it going.

Steve Travis,
Barnsley

After much experimenting in the office I'm afraid that we've come up with a blank regarding your pound sign. You can alter the keypad using the KEYDEF program that is on your system disk to alter the code that any key on the keyboard prints. All we can suggest is that you change the character code that is assigned to the pound key to the same code that your printer expects for this character. You may find that the character does not appear as a pound on the screen, chances are it will be a back slash, but as long as your printer is set up to print a pound you should have no problems. See your printer manual for details on the code to use for a pound sign.

The same program KEYDEF can be used to set the screen colours upon boot up. Don't make changes to the system disk supplied with your C128, make them on a copy of it. KEYDEF has quite a large help file associated with it so you should have no problems using it.

If anyone knows of a better way to allow Mr Travis to have a pound sign please let us know.

Glad to hear that you like the mag and 128 Corner. Remember keep writing in with any tips, hints, views on software and general queries and we'll do our best to keep this page both topical and informative.

Video Memory Expansion

Dear 128 Corner,
In the July issue of Your Commodore you mentioned the video memory expansion from ESS1 that brings the video memory of the VDC up to 64 K and you said that you don't know an order company that sells such an expansion.

There is a company in Switzerland that sells such an expansion and also a special Basic that supports the new memory. With this Basic you will be able to reach a resolution of 768x720 pixels.

The program is called Graphic Booster and it is available with the memory expansion for the C128/D in the plastic case and without the expansion for the C 128 D in the metal case. Contact Combo AG, Tuggenerweg 3, CH-4580 Solothurn, Switzerland.

J. Brits
Tuggeringen
W. Germany

It's good to see that Your Commodore reaches parts that other computer mags cannot reach!

Thanks for the info on the Swedish company, other readers may wish to contact them directly at the address quoted. I have written to the company myself and will let you know through these pages about prices and any other C128 goodies that they may have available as soon as I get a reply.

18 Info I won't go

Dear 128 Corner,

I have just read your article C128 Corner in the recent edition of Four Commodore, and must congratulate you upon taking the initiative to set up a regular page for C128 users.

I have been a Commodore fan for a number of years, and earlier this year decided to upgrade from the old faithful C64 which had served its purpose well but was stretched to its limits. Although the Amiga and PC clones looked very attractive, the initial outlay for both hardware and software was prohibitive!! so the C128D was bought, and C64 sold, the prospect of wider horizons for myself, and loss of old C64 software to keep the kids happy. Then the bubble burst.....where was all the software and support for this machine.....ah dear I've bought a dud!! etc etc.

However I can now say how pleased I am with the C128D, with real wordprocessing (courtesy of Superwrite), and a machine which can offer the budding programmer 2 processors to play with. I have progressed now to the stage of writing small Z80 routines in 128 mode and transferring them over into CP/M, and feel that the opportunities for learning are once again wide open. OK, my pals with the PC clones can still boast massive memories, terrific speeds, and huge cost for software!! but many admit when having seen the C128 in action that its presentation and results are virtually as good, but the C128 is far more versatile and offers the learner far more scope.

Is it beyond the bounds of possibility for an MS DOS emulator to be constructed with the Z80, or is it exclusive to the 16 bit machines? I have looked at a few MS DOS books for hints on how the system is put together but all that I can find is user instructions... no nitty gritty!! Does anyone have any thoughts on this??

I have tried CP/M software from Digital which has been written for a Rainbow computer but the 1571 is unable to read the discs, should I be looking at modifying the disk parameter table or am I expecting the impossible here!! any hints??

I will certainly do my best to keep the comments flowing in to support C128 corner, and I hope many of my fellow C128 users will do the same. Well done to YOUR COMMODORE and thanks for your support.

Chris Allen
Langkates

Glad to hear that you're a C128 fan like Allen. Here at this office we all think that much of the software written for the C128 is far superior to that written for the 16-bit machines like the PC or Amiga. If you're into using CP/M why not get working to with tips and articles as I'm sure that CP/M is an ability of the C128 that most users never use.

I'm afraid that MSDOS is designed for 16-bit computers not 8-bit like the C128 and you'll not be able to run MSDOS on your machine. ☹

As for your problems running CP/M software for the Rainbow. There are two versions of CP/M around. One, that on your C128, is written for 8-bit computers like others for 16-bit machines. You can't run software written for 16-bit machines on your C128, because of course that just about any piece of software written for 8-bit CP/M.

Get In Touch

C128 Corner is a forum for all 128 alerts. If you have any comments, suggestions or questions do send them in. Whether your contribution then 128 Corner will not be able to continue, so come on, write too.

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THE END IS NIGH

Bribe of the Month



**The big wobbly jelly spider
- Virgin Mastertronic**



Ad Manager in brain swap shock

Paul Karamagh, Ad Manager on your big wobbly YC, recently undertook a painful operation which scientists have been trying to perform for years. He volunteered to have his brain swapped with that of a new born chimp. When asked if it was a success he replied "Ooooo! Ooooo! Oooooo!". Fellow staff members have noticed a dramatic improvement.

Christmas is coming

As a special competition for Public Relations peeps, YC has opened a Christmas hibernaculo. In our January issue (which promises to be big and wobbly) there will be a league table with a list of the top ten frebies received by the press date, and the companies who donated them.

Reader participation

If anybody discovers a small Commodore/computer related news item, or piece that they think would fit a page of this caliber, send it in and we'll raise a prize for every one printed. Be careful though, we don't want anything that may raise us UP to gutter level.

Gazza signs for wrong game

Paul Gascoigne was obviously confused at the recent press launch in aid of his new game. He performed a photo shoot in what one might call a 'half' Batman costume for the shoot photographers that arrived. This was either a very clever ploy by Ocean software's Gary Henry, or he was modelling next year's Tottenham strip. I know which excuse I'd plump for.



Freddy finally killed off

Ha! Ha! U.S. Gold does what no American teenager could, it has eliminated the master of dreams himself, Freddy Krueger. Although we had played a large feature on Mr. Plazadace, we have been informed that the computer game has been scrapped and there are no plans to resurrect it in the future. Mr. Even you can take the mask off now. What do you mean "what mask?"



The Computer Industry Karma Sutra

No. 1



**A ball in the hand is worth
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